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Cups, Cones and Rollers

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INCREASING use of tapered roller bearings in many kinds of machines, and in the new electric locomotives of the Pennsylvania Railroad, shows a growing appreciation of the economy of reducing friction and makes information as to their manufacture of special interest. Roughly speaking, all roller bearings consist of inner and outer races with rollers between. In the Timken bearing, the rollers are tapered and the races are referred to as cones and cups. Some of the methods used in making these bearings in the Timken plant are shown herewith.

The races for the larger sizes of bearings are forged rings of special alloy carburizing steels. The machining operations on these units consist of boring, turning and facing, with finish grinding after the final heat-treatment. This machining involves many operations in which extreme care is necessary.

The rollers are a screw machine product, with finish grinding as the final operation. All down the line at this plant is a series of inspections that require a larger percentage of the shop personnel than is found in most industries. One in every three of the plant workers devotes his entire time to inspection, continually checking the accuracy of the product.

Two kinds of roller bearing assemblies are used for railroad work, the pressed-steel cage and the pin-type cage, as shown in Figs. 1 and 2. The first is a double-row bearing consisting of a double inner cone or race, two sets of rollers in cages, and two outer cups or races, which are not shown. The pin type bearing is shown in Fig. 2. Here the rollers are held in place by pins through the center, the pins being welded into the rings at each end of the rollers. The cone in the bearing shown has a stress relief groove turned in one end to reduce stress concentration caused by press fitting when it is mounted on an axle. This is also a double bearing. However, single row bearings are used in certain applications, although not as generally as are the double row units.

Both cups and cones of the smaller and medium sizes of bearings are machined inside and out on semi-automatic machines such as the unit shown in Fig. 3. Special jaws are provided that have large bearing surfaces at six points. It will be noted that the taper is bored with the large diameter at the inner end. The tool bar has a rigid support just outside the work. For machining the outer surfaces the races are held on special expanding chucks, with serrated jaws that hold them firmly against heavy cuts.

Fig. 1—Double-row railroad bearing having a pressed steel cage. Fig. 2—This double-row bearing has a pin-type cage. Both types are now in service on new electric locomotives of the Pennsylvania Railroad

The first heat-treatment in railroad bearings is a drawing operation and takes place between the rough and finish machining. The second heat-treatment, which includes carburizing, is done after the finish machining. A depth of case of about $\frac{3}{32}$ in. is considered suitable for most of the sizes. Pieces from each heat are carefully tested for depth of case and other qualities.

After machining, and before grinding, the cups and cones are hardened, using specially designed spiders to prevent distortion. The heated cone or cup is dropped on one of these spiders as in Fig. 4, held in position by an upper plate and the heavy key driven through the central shaft. The arms of the spider are made thin or narrow where they contact the unit so as to allow free circulation of the quenching oil. The whole platform is lowered into the quenching bath beneath it. Use of the spider practically prevents distortion during the quenching.

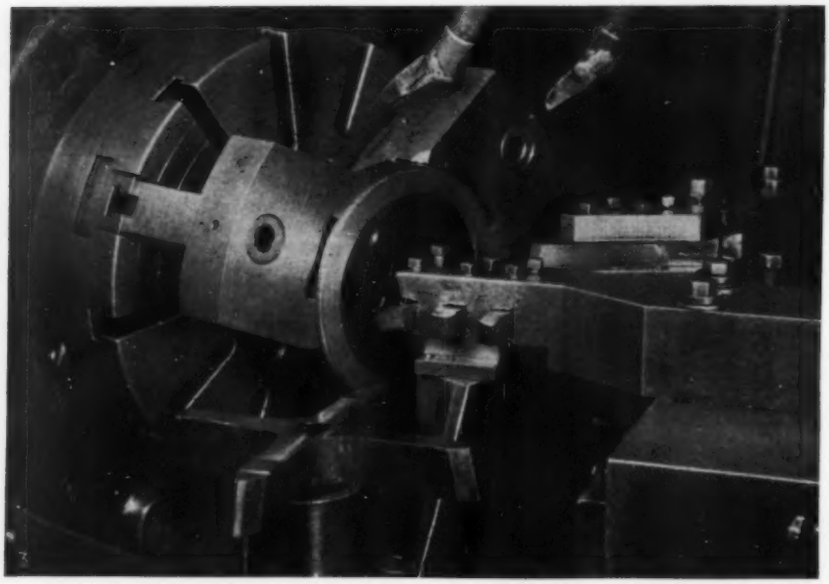


Fig. 3—Special chuck jaws hold the cone while a supported tool bores it to the correct taper in a semi-automatic lathe

Grinding Bearing Parts

Grinding of the cups and cones requires and receives careful attention. Among the types of machines required are the rotary table surface grinder for the ends, shown in Fig. 5. Not only is diameter important on the inner surfaces which fit the shaft and the bearing housing, but both diameter and angle are vital on the tapered bearing surfaces of the cup and cone. Grinding machines for this work require not only initial accuracy but also the best of maintenance and treatment. In this connection it is inter-

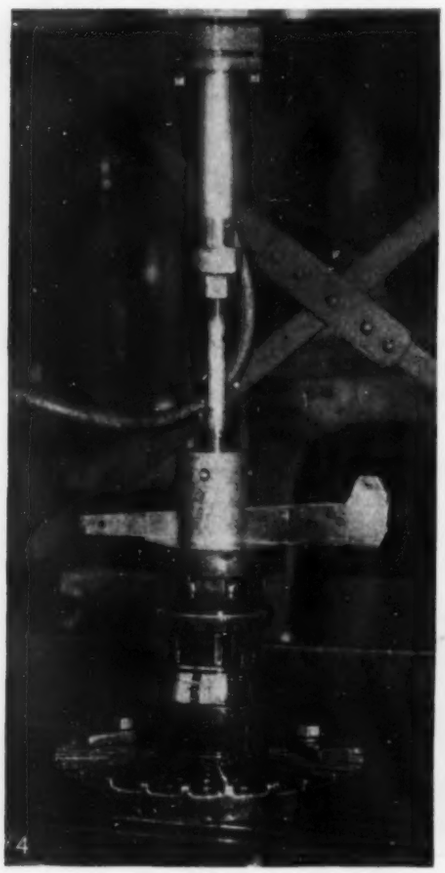


Fig. 4—Cups and cones are held against distortion in hardening.
Fig. 5—Ends are ground on a magnetic chuck on a rotary table

esting to note that almost all machines used in the Timken plant are practically fully roller bearing equipped.

A special new machine for grinding bearings up to 65 in. in diameter, such as are used on steel mill roll necks, has just been installed. Certain railroad bearings, such as those on locomotive driving axles, can also be ground on this new machine. This is practically a vertical boring mill with grinding spindles instead of tool heads on the rams. An interesting feature of this machine is the use of threaded stop collars that fit threads on four of the eight sides of the rams. The other four sides form the bearing surfaces in the ram slides. These large stop collars can be easily adjusted to close limits, and when locked in position act as positive stops.

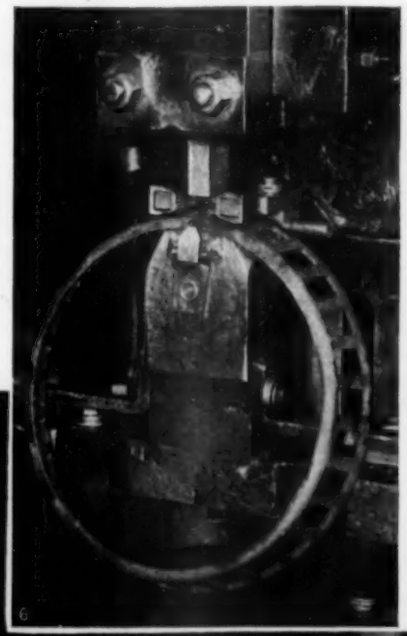
Making the Rollers

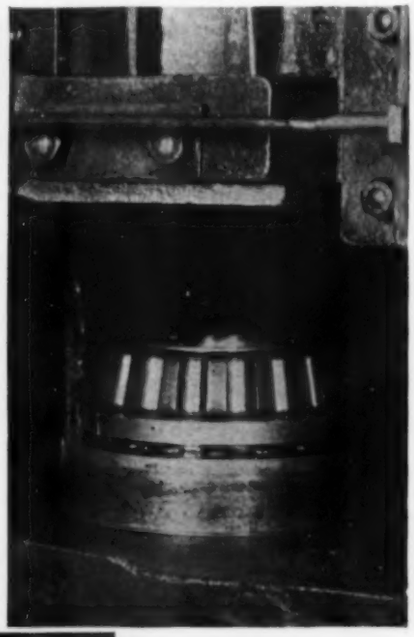
Rollers are made on both turret lathes and automatic screw machines; after heat treating and hardening they are ground to size. The large rollers are ground on plunge-cut, centerless grinders. An interesting method has been devised for grinding certain of the small rolls by the "through" or continuous method. The feed wheel has a helical groove, or thread, cut its entire length, feeding the roller to be ground so that the side next the grinding wheel is parallel with the spindle. By this means the rollers enter the grooves continuously and are rotated against the grinding wheel. They travel along the groove and are fed out the finish end in a continuous stream.

Cages are of two types, pressed-steel and pin-type. The first type is formed in a press to the desired shape and then punched for the rollers as in Fig. 6. A simple visual index is provided for the operator. After punching, the cages are "winged," or the slots are curved, to the radius of the rollers. In a later operation, as a part of the assembly, the cages are closed in with the rollers in place. In the case of railroad bearings this is done in the press as in Fig. 7.

Constant Inspection

Machining and grinding are, however, only part of the manufacture of roller bearings. Constant and rigid inspection is evident all though the Timken plant. Inspection takes many forms, much of it visual. Every roller is inspected under special lamps, to de-





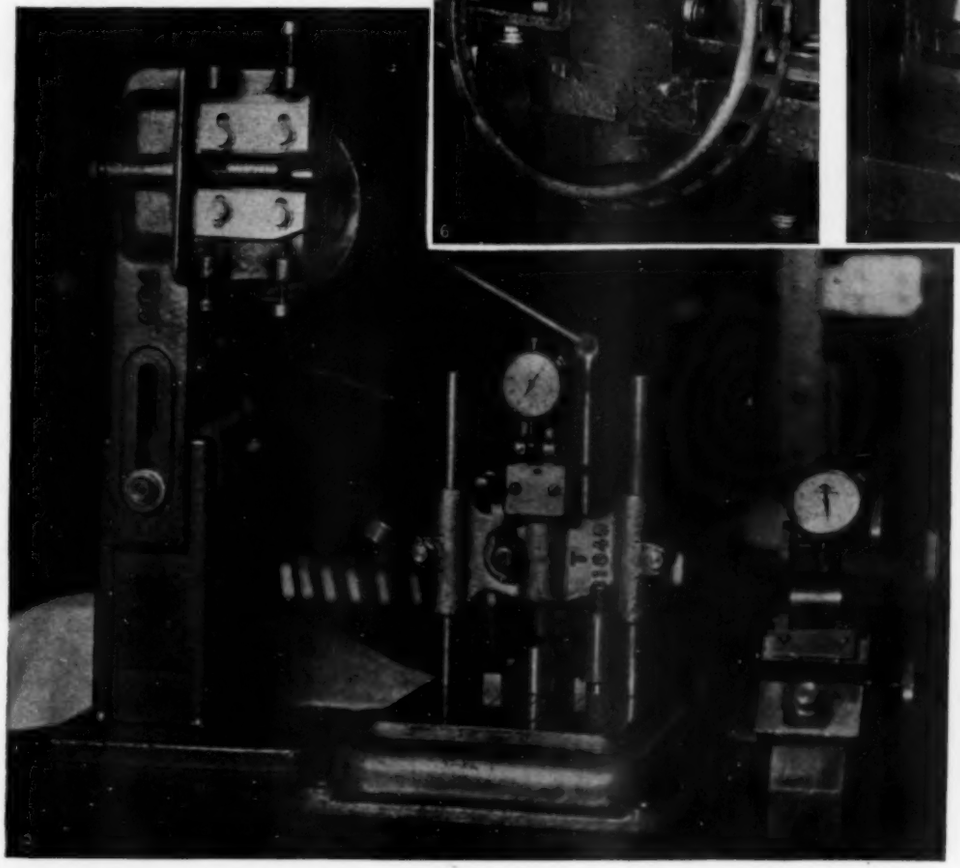
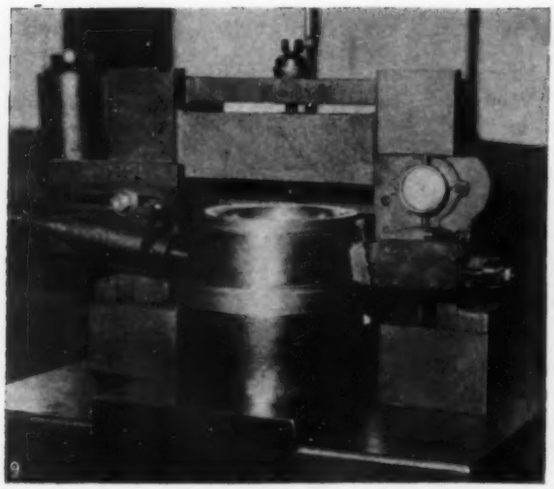


Fig. 6—Punching large cages for holding tapered rollers. The larger sizes are indexed visually. Fig. 7—Edges of slots are "winged," or curved, to radius of rollers by putting rollers in place and closing with a special die

Fig. 8—Three of the inspections of rollers: for taper, for length, and for diameter at any point along the length of roller



Figs. 9 and 10—Two of the tests for correct taper and accuracy of surface of cones. Turn-tables and hooded lamps make it easy to detect even slight errors of any kind

tect even minute surface flaws. The cups and cones are also carefully inspected, usually with special instruments, some of which are shown here. Bearing surfaces are proved with Prussian blue and inspected in much the same way as surface gages.

Even slight variations in diameter on the tapered surfaces would affect the alignment of the races when the rollers are in place. This factor is carefully watched to secure just the desired condition for the bearing. One inspection bench for rollers is shown in Fig. 8, where several inspections are made. The gage at the left checks the taper by the well recognized and reliable light method. The stand is adjustable in height to suit the inspector. A suitable light behind the knife edge gage-blades shows any variation from the proper taper.

Roller length is carefully inspected by the gage in the center, while the diameter can be checked in "tenths" by the instrument at the right. The roller is here supported by lapped diamond point contacts and also positioned by a diamond point at the large end. With the roller held so that its upper surface is parallel with the slide on which it is mounted, it can be moved lengthwise so that it can be measured at both ends, or at any point between.

Two methods of inspecting a railroad bearing cone are shown in Figs. 9 and 10. In both cases the cone rests on a turntable to permit easy inspection at any point on its circumference. Variations in diameter are checked as shown in Fig. 9.

The gage shown in Fig. 10 is also used on a turntable. This is a three-point gage, the adjusting screws being shown at the left. With these properly set the gaging surfaces at each end of the crosspiece exactly fit the tapered surface of the cone. A hooded lamp directly behind the adjusting screws throws light on both gaging surfaces and yet keeps it out of the eyes of the inspectors. The turntable permits the work to be turned to any position and facilitates inspection of the heavy units.

All railroad bearings are given a test run under load, and before being finally passed for shipment, they are placed on a special stand for final inspection. This stand is mounted at a convenient angle and is so lighted from beneath that the inspector can see the contact of each roller in the cup and cone, as he turns the bearing, shown in Fig. 11. If any roller of incorrect size has found its way into the bearing, this test shows it at once and the whole bearing is returned for reassembly. With rollers of proper size the light from beneath will make a path of light on each side of the roller in the top position, as shown. Unless each roller meets this test the bearing is not permitted to leave the plant. Needless to say, this seldom happens, as the utmost care is taken to sort even the slight variations permitted into classes for assembly together. This final inspection is simply an additional safe-safeguard for the user to insure long operation without interruption.

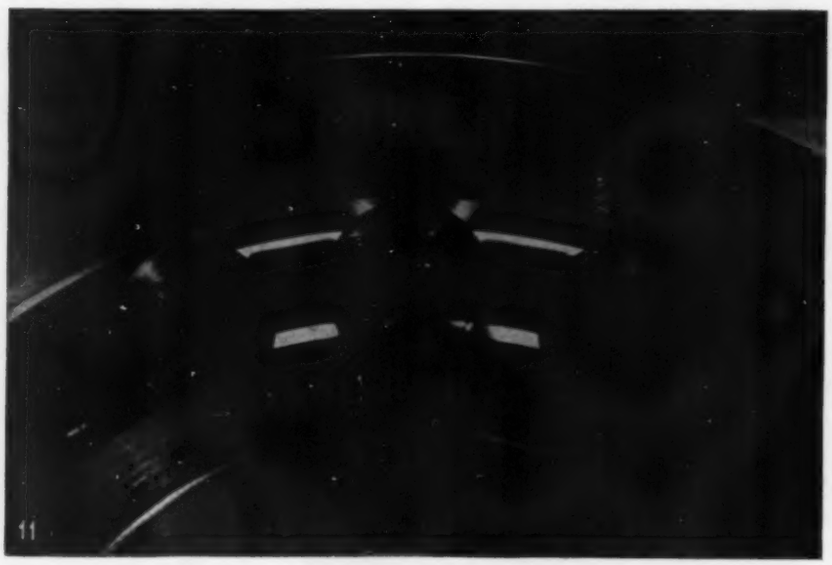


Fig. 11—Final test after bearings have had a test run. This light test shows even minute variations in roller diameter

Equipment Selection for Greatest Economy

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SURVEYS conducted recently by *American Machinist* and by the Machinery and Allied Products Institute prove conclusively that much of the equipment in our factories is obsolete and should be replaced. The producers of manufacturing equipment are trying desperately to break the log jam of deferred purchases of their products, and the very fact that so little equipment has been purchased during the last five years is finally beginning to strike some telling blows in their favor. After all, equipment must be replaced some time, and most of our manufacturers would find it necessary to purchase some new equipment before their production could be stepped up to predepression levels.

We are now experiencing a great increase in the production of automobiles. A similar increase in the demand for manufacturing equipment may occur at any time, and for much the same reasons. One has only to question those who have recently purchased automobiles to discover that many of them were no more willing to purchase a new car this year than they have been for the past two or three years. Such persons bought new cars because it was at last evident to them that it was no longer economical for them to continue to use the old ones.

The primary purpose of this article is to urge equipment users to make studies now of what their equipment requirements would be if their production increased to what they would consider normal; also to suggest how such studies might be made. When the present log jam is once broken, it will be those companies which have well thought out plans for re-equipping their factories who will make the necessary investments to the best advantage and who will be the first to get the equipment into operation. It should be borne in mind that the MAPI survey indicates that it would take at least two years for the machinery industry to take care of the accumulated demand alone, and this industry would require some time to step its own production up to normal. A machinery user who makes a comprehensive survey of his manufacturing equipment now will also probably find opportunities to make profitable replacements even under present conditions. He will also have the advantage of doing this work at a time when his organization can devote more time to such an activity and when the machinery producers have more time to discuss possible economies.

Funds Used for Best Return

A manufacturer who does not prepare in advance a comprehensive plan for replacing equipment will be forced to consider each new machine as a separate problem, and presumably at a time when there is an urgent need for increasing his productive capacity. Even if it should happen that the equipment purchased under such conditions might show an advantage over present equipment, it is hardly likely that a manufacturer would be so lucky as to happen to make those replacements which would be most profitable. There is little doubt that there is plenty of capital available to purchase all the equipment that the machinery industry could produce, but it is certain that few machine users could obtain the money necessary to replace every piece of equipment that might be considered obsolete when compared with new equipment. The only safe way is to make a comprehensive survey of all equipment in a plant and to use the money that is available for those replacements that will be most profitable.

It is to the advantage of both machinery users and machinery producers that the most profitable replacements should be made first. The more profitable the early replacements the more money there will be for making later replacements. Machinery replacements almost invariably increase fixed charges and unless the increase in fixed charges is less than the decrease in operating expenses the replacement is not profitable. A replacement that is not really profitable is extremely undesirable, because it reduces employment per unit of output without any compensating advantages. Under present conditions it would probably be difficult to find very many replacements that could show no advantages, but only a careful survey of the whole situation will disclose which are the most profitable replacements.

The information obtained from a comprehensive study of all the equipment in his plant would be valuable to a manufacturer in his own cost studies. For example, depreciation on manufacturing equipment is a constantly increasing part of total costs, and the sort of study advocated in this article would be of great assistance in setting the proper depreciation rate.

Definite Planning

It seems odd that, in this day of budgeting nearly all industrial factors, so little attention is being paid to the definite long-time planning of equipment replacement. A great many articles have been published during the last few years on this important subject, and a considerable number of manufacturers have at last begun to realize the desirability of having a definite plan for replacing their equipment. Unfortunately these manufacturers are a small minority of all manufacturers, and the articles on machine replacement generally deal with individual replacements instead of advocating a

comprehensive plan for making studies of all equipment.

Many formulas have been developed for use in replacement studies. After spending some years in studying all the formulas I could find, and perpetrating a couple myself, I have come to the conclusion that the disadvantages of the formula are generally greater than the advantages. A large proportion of the formulas that are being used are positively dangerous in the hands of a man who has not made a close study of the replacement problem, and some of the formulas can be shown to give results that are incorrect because of faulty derivation of the formula itself. It is here suggested that instead of using a formula it is better to prepare an orderly tabulation of the total annual charges, both fixed and operating, for each machine that is being compared. Replacements are generally of sufficient importance to warrant careful study by an experienced executive, although the tabulation of charges may be performed by a careful clerk.

It should be remembered that there is absolutely no connection between the methods that should be used in making replacement studies and those which are properly used in cost accounting to determine the costs of the various items which are produced by a machine that is actually operating. In making a replacement study we are comparing two or more methods of doing a certain thing; in cost accounting we are simply determining the cost of doing a certain thing by means of a single predetermined method. Because of this difference the cost accountant may properly omit certain factors, such as interest on invested capital, which must be included when making a replacement study.

Tangible Factors

An orderly tabulation of all of the tangible annual charges necessary for performing the expected service should be made for each machine which is being studied. As these charges include an item for return on invested capital, the machine showing the lowest total annual charges would ordinarily be the most desirable. It should be noted, however, that there are usually a number of intangible factors which cannot be included in the tabulation of charges, but which should be considered in making the final decision. This is the principal reason why the final decision should be made by an experienced executive. The method suggested in this article makes it possible to compare any number of machines. Most formulas can be used to compare only two machines at a time, which makes the solution of the problem rather tedious where there are a number of machines to be compared.

The annual charges against a machine should be divided into fixed charges and operating expenses. These should be kept separate, because the fixed charges are practically constant, while the operating expenses vary almost directly with the amount of time the machine is in use. Fixed charges include return on invested capital, insurance and taxes, and depreciation. Maintenance is often included among the fixed charges when making replacement studies, but I prefer to consider it as an operating expense.

Many formulas simply credit the proposed machine with the saving in operating expenses and debit it with the increase in fixed charges, but I believe that a better picture of actual conditions is obtained by charging each machine with its total annual charges. For example, a saving of $2,000 per year would not be nearly as impressive when it was the difference between total charges of say $100,000 and $98,000 as it would be when it was the difference between total charges of say $10,000 and $8,000, yet the two cases would show up exactly the same if only the differences in operating expenses and in fixed charges were used.

Return on Invested Capital

In making a machine replacement study it is essential that some charge should be made for the use of the capital invested in each of the machines that are being compared. Unless this is done the study will give a result that is too favorable to the machine which requires the larger investment. Most methods that have been advocated simply charge the investment with a simple interest rate, say six per cent, and then attempt to determine the additional return that will be earned on the investment. Space limitations prevent an extended discussion of the difficulties of this method, but I believe that the method described in this article is not only much simpler but that it also gives a better picture of the situation. No one would consider making any investment which promised merely to give him a simple interest return on his investment. As a general statement of the investment situation, one may safely say that the rate of return that is expected when an investment is made varies with the risks that are involved. Capital will ordinarily enter a very speculative venture only if the calculated or "expected" return is very great, and the more speculative the venture the higher this expected return must be in order to attract the necessary capital.

It is here proposed that in making a replacement study the capital investment required for each machine should be charged with that rate of return which would make the investment attractive, when consideration is given to the risks that seem to be inherent in that particular investment. If this is done, and the machine shows a saving in total annual charges, it would seem to make little difference how large the investment is, although where there is little difference between the total annual charges it would be reasonable to select the machine requiring the smaller investment. Depreciation and all other real costs will be charged separately and therefore should not be considered in any way in setting a rate for desired return on invested capital. This may be thought of as the rental value of money invested in this particular way.

Charging Depreciation

In most cases depreciation is figured by the straight line method, in which case it is proper to figure the investment charge on the depreciated value. In making replacement studies we generally desire to have the annual charges uniform throughout the life of the equipment. To obtain this result we may either figure the rate of return on the average value of the investment itself or else figure an average rate of return on the initial investment. If depreciation is charged by the sinking fund method it is necessary to charge the full rate of return on the initial investment during the entire life.

In order to make the proper charge for use of invested capital it is necessary to determine what the investment really is in the case of both present and proposed equipment. Everyone will agree that the investment in proposed equipment is the total cost of the equipment in place ready to operate. There are three possible values that might be used for the investment in present equipment; first, the original cost; second, the book value; third, the realizable value, which may be scrap value, second-hand value, or value to the same company for some other purpose. Some investigators have actually used the original cost, but such a procedure is clearly incorrect. Equipment is certainly under no obligation to earn a return on that part of its original cost which has already

been written off through depreciation. If the original cost of present equipment is used, the result will be unduly favorable to the proposed equipment, because the higher fixed charges on present equipment will make the cost of using the present equipment appear greater than it really is.

The same reasoning applies to the use of the book values of the present equipment, although the resulting error is naturally not so great. Those who would use the book value of present equipment apparently believe that the book value is a real value. As a matter of fact the book value is simply the difference between the original cost and the depreciation that has been charged up to that time. No matter how carefully prepared, depreciation rates and book values are merely estimates. The actual depreciation, which has occurred and which should have been charged as a part of the cost of the products of the equipment, becomes known only when the equipment is displaced. In making a replacement study we are interested in determining what the result will be if the replacement is made, therefore the only reasonable procedure is to base the fixed charges on the realizable value of the present equipment.

Book Loss Not Charged

Another error is sometimes made which has the effect of unduly penalizing the proposed equipment. When equipment is replaced on account of obsolescence, before it reaches the end of its originally estimated life, its book value will generally be higher than its realizable value. It is often argued that the capital loss which seems to occur at this time is caused by the replacement, and that any such loss should be charged against the new equipment.

Such a procedure is entirely incorrect. The fact of the matter is that any difference between book value and realizable value simply represents additional depreciation which has occurred and which should have been charged as part of the cost of the products of the replaced machine. It may not have been a loss at all. The replaced machine may have been so profitable that there would have been a net profit even if the total actual depreciation had been charged against it.

The charge for insurance and taxes should be handled in much the same way as the charge for return on invested capital.

Equipment is expected to earn not only a return on invested capital but also an amount which will repay the decrease in value of the equipment during its life. In a replacement study the depreciation rate should be based upon the period during which the machine is expected to pay for itself. For example, if we have made up our minds that we shall not purchase the machine unless the study indicates that it will pay for itself in four years, the depreciation rate (using straight line depreciation) will be 25 per cent. There is no connection between the depreciation rate used in the replacement study and the depreciation rate that will be used on the books in case the machine is actually purchased. This depreciation rate should be high enough to include the decrease in value through ordinary depreciation and also through possible obsolescene.

Operating Expenses

The method to be used in charging each machine with its annual operating expenses is simple and needs little explanation in itself, although it may be desirable to give an explanation of the reasons for calculating the annual operating expenses instead of operating expenses per unit of finished product. It seldom happens that different machines will have the same total capacity and, for that reason, comparisons based upon unit costs, with each machine working at capacity, will not give correct results. Several different methods have been advocated for handling this particular problem, but the simplest and best way seems to be to determine the production that will be required and then to calculate what the annual operating expenses will be in producing this amount.

In making replacement studies the writer separates the operating expenses into the following classifications: upkeep or maintenance; power, supplies, etc.; rental value of space allotted to machine; material; direct labor; indirect labor. All of these are expressed in dollars per year. In many cases, where there is little difference between machines for certain of these items, these particular items may be omitted altogether. However, if this is done, the annual total charges of all kinds against each machine will not be known and this information is sometimes of considerable value to the manufacturer.

The reason for calculating the rental value of space allotted to each machine is that machines often require different amounts of space in the factory, and this space has value. It should be noted, however, that if the proposed machine will require less space than the present machine, the proposed machine should not be credited with the rental value of the space that will be released unless that space may be used for some other productive purpose. This factor includes fixed charges on land and building; also such items as the cost of heat and light. In fact it includes all of the overhead costs not definitely included in any of the other factors. Companies using the machine rate method of distributing overhead will be able to get this information directly from their cost accounting records, although this factor includes only part of the items which are included in the machine rate.

There will rarely be much change in indirect labor on account of a machine replacement, but it is perfectly possible for the indirect labor cost to either increase or decrease. Many companies distribute overhead as a percentage of direct labor. This approximate method of charging overhead may be fairly satisfactory in many instances, but it is certainly not proper to assume that either indirect labor or overhead in general will decrease in the same proportion as the decrease in direct labor that may result from a machine replacement. In fact, if the direct labor is decreased, the presumption is that the indirect labor will represent an increased *percentage* of direct labor.

Manufacture or Purchase?

The method outlined in this article may be used to determine whether an article should be manufactured or purchased, and has additional advantages over other methods in problems of this sort.

It will be noted that in this method no attempt has been made to determine how much money one can afford to invest in a proposed machine, how soon the machine will pay for itself, or what the rate of return will be on the additional investment in the proposed machine. Many other methods for making replacement studies are based on a determination of one or more of these factors, but it can be demonstrated that they cannot be determined correctly without the use of rather complicated mathematical procedure, which at best fail to give a true picture of actual conditions. Fortunately the method outlined in this article, which involves only a few

simple calculations, gives all the information that is required.

There is no need to determine how much money one can afford to invest in a proposed machine. Either the cost of the machine is known or else an estimate of the cost can readily be made, and the problem is simply to determine whether the machine will show an attractive saving after all charges, including the expected return on invested capital, have been assessed against it.

Forced to Pay For Itself

There is no need to determine how soon the machine will pay for itself. A decision should be made as to the period during which the machine will be expected to pay for itself, and the machine should then be charged with a depreciation rate that will force it to pay for itself (plus the expected return on the investment) during that period.

There is no need to determine the percentage return on additional investment. The essence of the present method is to charge every investment with the percentage return required to make that investment attractive and then to determine whether the saving in total annual charges with the proposed machine is worthwhile. This saving may just as well be in dollars as in a percentage return on additional investment.

The method described in this article automatically takes care of cases where the proposed machine has a greater potential capacity than will be required at present. In such cases, if the proposed machine cannot show a reasonable saving on the basis of present production, the replacement should be postponed until production increases to the point where the proposed machine will show a reasonable saving, or until some other machine is developed that will show a reasonable saving on the basis of the actual production. If this precaution is not observed the new machine may itself be obsolete by the time the production increases to an amount that will utilize its full capacity.

In this discussion the replacement problem has been considered from the standpoint of cost alone. There may be many other reasons for making replacements.

It is not possible to discuss fully in this article the different methods that may be used in securing funds for making replacements, but it may be well to refer briefly to several phases of this particular problem. Under usual accounting methods the amount of money which is charged against equipment for depreciation never appears on the books as cash which is to be used for replacing this equipment. Boards of directors may refuse to authorize replacements which are desirable, simply because there are no liquid assets which have been set aside for this particular purpose. To overcome such difficulties it is sometimes suggested that companies should set aside each year an amount of cash equal to the depreciation which has been charged and that this money should be used for no other purpose than the replacement of equipment. Such a policy would have certain advantages but it also would have certain disadvantages.

This replacement fund would naturally be invested in what were considered safe securities, the return on which would be less than the interest rate at which the company was borrowing money. For that reason it would seem better for the company to use the money in its own business, where the return would probably be much greater, until the time came for the money to be used in making replacements.

Use of Funds

In the case of most companies there is still another policy that could be followed that should be more desirable than either investing these funds in good securities or using them in the business while waiting for the time at which to make replacements. The best way of all would seem to be to replace equipment each year to the extent of the depreciation that actually occurred during that year. It may not be possible to follow this policy exactly, but where it can be done there are many advantages. All companies could use this policy to some extent. Under such a policy there would be no need to raise large sums of money at irregular intervals for making extensive replacements. The company would have the advantage of up-to-date equipment at all times. There would be little difficulty in getting the federal government to approve the depreciation rate which the company felt was proper. The fluctuations in the demand for equipment would be much less severe, and in the long run machine users would pay less for their equipment and secure better equipment, because of the reduction of the peaks of extreme demand during which equipment prices are very high and quality cannot possibly be as good.

American manufacturers are looking forward eagerly to the day when industrial production will increase to what might be called normal. Many manufacturers seem to believe that their principal difficulties will vanish when that day comes. The truth of the matter is that competition will be just as hard to meet then as it is now, and the possibilities for making a profit will be just as slim as they are now for companies which do not have modern equipment. A plant that was the last word in equipment and in efficiency in 1929 will not be able to compete in 1935 or 1936 if competing plants are brought up to date. The real test of efficient management will come when we get out of the depression. At present if a company is not making a profit that fact can be charged to the depression. No such excuse will avail when the depression ends and companies which are efficiently operated begin to show a profit.

Laggards Will Suffer

Plants with obsolete equipment do not show up so badly now when nearly all factories are in the same condition. When modernization begins on a large scale those companies which do not have a well thought out and comprehensive plan for replacing obsolete equipment may find themselves left at the post with little chance of catching up with the leaders. When that time comes there will be no opportunity to make comprehensive surveys. Equipment will have to be purchased immediately and it is unlikely that the money which is available will be used in purchasing those items of equipment which will be most profitable.

Every manufacturer should prepare right now a comprehensive survey of what his equipment needs would be for various increases in his own production. If this information is available he will be able to place his orders for equipment in advance of those competitors who must make their plans after the need for new equipment becomes apparent.

No attempt has been made in this article to give examples of replacement studies made by this method. A much more complete discussion of the method itself, with examples showing in detail how studies may be made, has been published in Engineering Extension Division Bulletin No. 32, of the Virginia Polytechnic Institute, "The Selection and Replacement of Manufacturing Equipment, A Discussion of the Economic Factors."

Turret Lathes Tooled for Plastics

R. T. CLOYES
President, Cloyes Gear Works

Laminated plastic timing gears are turned with tool set-ups similar to those used for metal parts

TIMING gears for Ford cars are made on turret lathes by the Cloyes Gear Works in the same manner as if they were made of steel instead of Micarta. Manufacture of the gears is begun by Westinghouse, where Micarta is made. Metal bushings are placed in the centers of the molds when the gear blanks are pressed; both bushings and gear faces are sufficiently oversize to allow for machining. The web is of high luster and requires no finishing.

For the first operation in machining the gears in the Cloyes shop, the work is held in a three-jaw chuck on a No. 4 Warner & Swasey turret lathe; the metal hub is bored and reamed and then faced with a flat cutter of carbon steel.

The second operation is performed on a similar turret lathe with the work held on an expanding bushing arbor operated by the collet chuck mechanism. In this operation, four cuts are combined—straddle-facing both sides of the rim, turning the outside diameter and facing hub. All cutters working on the Micarta are of high-speed steel, and the cutter performing the facing operation on the hub is carbon steel.

In the first set-up the Micarta blank is bored and reamed and then the hub is faced; an exhaust duct carries away the dust

The second operation turns the outside diameter and faces the rim and hub with the work mounted on an expanding arbor

Chucked on a Moving Arbor

The expanding bushing arbor, or mandrel, permits the work to be gripped and removed without stopping the turret lathe; this makes high speed operation possible. This would not be practical on metal gears of the same diameter, such as steel or cast iron, where the cutter resistance would cause the work to turn upon the mandrel. Micarta, however, offers no such resistance. Both faces are machined by straddle-facing tools held on the cross slide, and at the same time a turning cut is taken on the outside diameter by a cutter held in the hexagon turret.

By using the expanding-bushing arbor it is possible to employ the straddle-facing tool and to grip the work without stopping the turret lathe for loading and unloading. Combined straddle-facing and turning saves the

time of one facing cut and the turning cut since all surfaces are machined at the same time. Constant running of spindle and arbor eliminate most of the chucking time.

The speed of the work, together with the tendency of Micarta chips to pulverize, makes it necessary to remove the dust by a powerful suction system; the mouth of the exhaust ducts is brought close to the cutting tool in all cases.

The next operation, consisting of cutting teeth on the blanks is done on a Lees-Bradner gear hobber. Accurate turret lathe operations make it possible to stack the gear blanks for this operation, the number depending on the design of the gear hub. On Ford timing gears, for instance, the gears are cut eight at a time. A backing plate mounted behind the last gear blank in the group prevents splintering as the hob completes its cut.

The final operation consists of drilling the holes in the web of the gear; these holes are provided to aid the mechanic in disassembling the motor for repairs. Cars of later design have timing gears with a groove on the outside diameter of the hub for attaching a screw fixture which removes and replaces the gear.

By the use of standard turret lathes and a minimum of special equipment, the Cloyes Works obtains a production on the first operation of 800 per eight hours and on the second operation of 1200 per eight hours. The machine equipment is also suitable for producing gears of other materials by a change of tooling.

Heat-Treatment of Cold-Heading Tools

PETER L. BUDWITZ

Careful heating and quenching are necessary to meet the severe service requirements of these tools

IN THE past decade or so, makers of certain types of cold-heading machines have aimed for compactness and economical operation in the design of their product. To gain these qualities the body dimensions of punches and dies were held to a minimum. Because of this and because tools for cold-heading are subjected to hard use, they require careful attention in their heat-treatment to derive economical results. The tools discussed are used for the cold-heading of wood screws; the heat-treatment outlined is a practical and economical procedure for achieving desired results.

The tool characteristic striven for is hardness for resisting wear and deformation, although not to a degree that would cause the tools to split under continual hammering. Certain forms of heading machines are capable of producing up to 172 headed screw blanks per minute, thus illustrating the punishment heading tools are exposed to in the course of a day's run.

Figs. 2 and 3 illustrate some forms of punches and dies typical of those discussed. The steels used for dies are of the following analyses: carbon 0.95 to 1.05, manganese below 0.35, and silicon 0.15 to 0.25, phosphorous 0.025, sulphur 0.025 per cent maximum; another grade contains the following elements: carbon 0.97, manganese 0.30, silicon 0.32, sulphur 0.017, phosphorous 0.016 maximum, chrome 0.08 per cent and a trace of nickel. The punch steel is of the same analysis as the former with the exception of the carbon content which is slightly lower, ranging from 0.90 to 1.00 per cent.

Although the analyses of the steels are stated it is advisable to try material of identical analysis from various sources of supply to obtain a grade which possesses the most desirable "body." The body of the steel is influenced by the grain size, and this characteristic has much to do with the performance of steel, especially in the case of heading tools.

The heating of the tools is done in a semi-muffled, underfired gas furnace, maintained at a reducing atmosphere. Water is used as a quenching medium; the temperature is held to 60 F. for dies and 70 F. for punches. The quenching tank is provided with a vertical nozzle the end of which is below the surface of the bath. The nozzle is, of course, for the purpose of directing a current of clean, cold water through the die holes and also to the punch impressions.

Tools having small body sizes are heated to 1,425 F.; for larger tools the temperature is raised to 1,450 F. Each charge of the furnace should comprise tools of the same body dimensions, and just enough of them to permit even heating and quick removal when the work is ready for quenching. Little soaking, if any, should be allowed. A satisfactory way of determining heating time is to lift a piece of work from the furnace floor at intervals; should a dark spot be observed on the furnace floor directly under the lifted piece it readily indicates that the work is still absorbing heat and is not heated throughout. When the dark spot is no longer visible the work may be quenched.

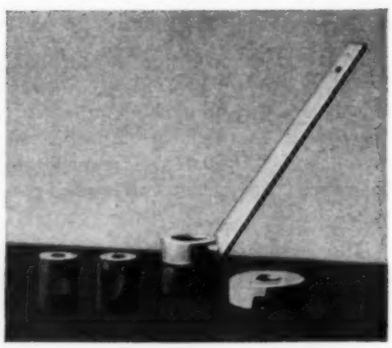


Fig. 1—For quenching, the die is placed in a holder and held tightly by a cap with a bayonet lock

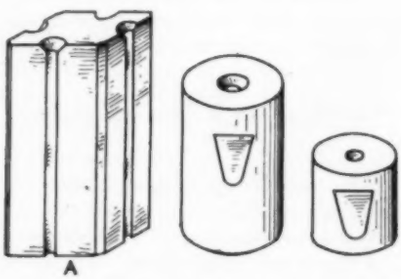


Fig. 2—The dies shown are typical of those discussed in this article

Fig. 1 shows a device which was made to quench the small body dimensioned dies containing large-sized holes and impressions; these are the most troublesome. It consists of a round piece of steel bored out to fit a specific size of die. The outer diam-

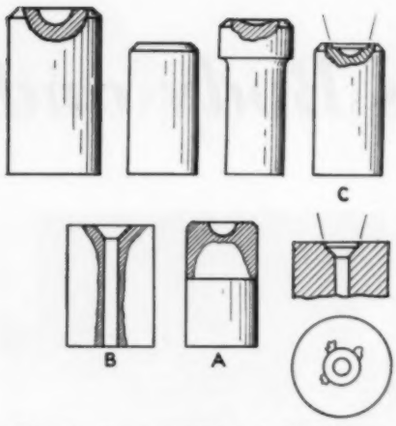


Fig. 3—Some additional dies illustrate penetration of hardening

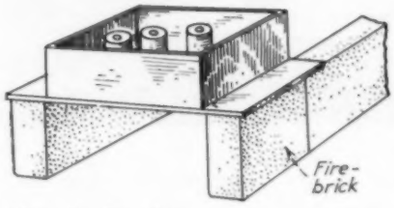


Fig. 4—Punches are drawn on an iron plate by heating with a gas burner placed below it

eter is large enough to form a comparatively thick wall. A handle is attached to it to facilitate the handling and quenching operation.

In use, the die to be quenched is placed in the device, and a steel cap like the one shown is slipped over the top and locked by giving it a slight turn. The device is immersed in the quenching bath directly under the nozzle, and a strong stream of water is directed at the tapered or countersunk hole provided in the center of the cap.

The purpose of locking the cap is to offset any possibility of its springing off in the quenching operation because of back pressure of the water. Locking is accomplished by two cammed slots provided in the cap which mate with corresponding pins in the body of the device. To furnish passage for the stream of water a hole is drilled through the bottom of the device a little larger than the wire holes in the dies.

Because the outer portion of the dies is shielded from the action of the quenching bath, the formation of a martensitic structure at these surfaces is interrupted. The hardening takes place locally, that is, through the center portion of the die, while the outside is composed of a soft yet tough structure. It is evident, therefore, that solid dies hardened by this method do not require drastic drawing since the danger of splitting is minimized by the soft outer portion, hence the wearing life of the dies is greatly increased.

Punches are heated, impressions downward, in shallow sheet iron trays partially filled with finely crushed charcoal. This method will retard the formation of oxide scales in the impressions which would otherwise form regardless of the care exercised in maintaining a deoxidizing atmosphere in a semi-muffled furnace.

When quenching punches, the force of the stream of water directed at the impressions should be moderated. At *A*, in Fig. 3, is shown the cross-section of a properly hardened punch, the shaded area indicating hardness penetration. Many punch failures can be attributed to lack of hardness penetration directly beneath the center of the impression. The cross-section die shown at *B*, Fig. 3, is typical of the ones quenched in the device previously mentioned; the shaded surface indicates the amount of hardness.

Tools are drawn immediately after hardening, the faces being polished so that drawing colors may be observed. Because of variations which are influenced by size, shape, and heading requirements of the tools, color oxides are used to determine proper drawing temperatures. As a typical example punches *C* and *A* in Fig. 3, both have comparatively large impressions thus necessitating greater drawing than if the impressions were for a much smaller sized screw head. They are drawn on a specially made box-shaped iron plate having a gas burner under it Fig. 4 illustrates the type of plate used. During drawing, the tools are covered with a sheet-iron plate (this plate is not shown in the illustration for the purpose of clearness).

Selective Drawing

Another factor which favors drawing by the color oxide and hot plate method, in preference to oil or fused salt bath drawing, is the ability to start the draw at some local point on the tools which do not have to be quite so hard as other portions. The intensity or speed of the draw may be regulated by proper adjustment of the gas burner. With a little experimenting a specific color to suit the requirements of each form of tool may be gained, then easily charted. And if the same procedure for drawing is followed, using the type of drawing plate described, uniform results may be obtained. In my experience with heading tools, drawing colors have ranged from a light straw to a light blue. A warmed oil bath is used to cool the tools after proper drawing colors have been reached. The Rockwell hardness tester is used periodically in double checking results.

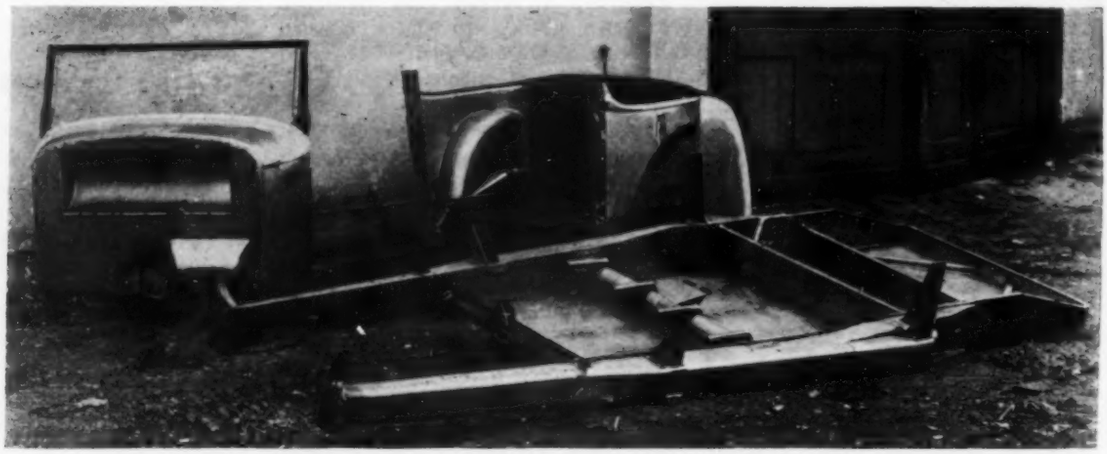
Private Hardening Methods

Previous to the advent of centralized hardening departments many of the workmen who made tools would harden them also. It has been generally believed that each workman had his own pet or secret methods of hardening. Possibly the reason why some got better performance from their tools than others was the care that was exercised in finishing their work prior to the hardening. This same care should be exercised by the tool foreman in the inspection of heading tools before sending them to the hardening department. They should be free from excess tool marks, especially where the impressions and wire holes are concerned. Since much of the work headed in the open type of dies, similar to the one sketched at *A* in Fig. 2, is machined in subsequent operations, the rounding of unnecessary sharp corners in impressions minimizes local cracking and chipping while the tools are subjected to use.

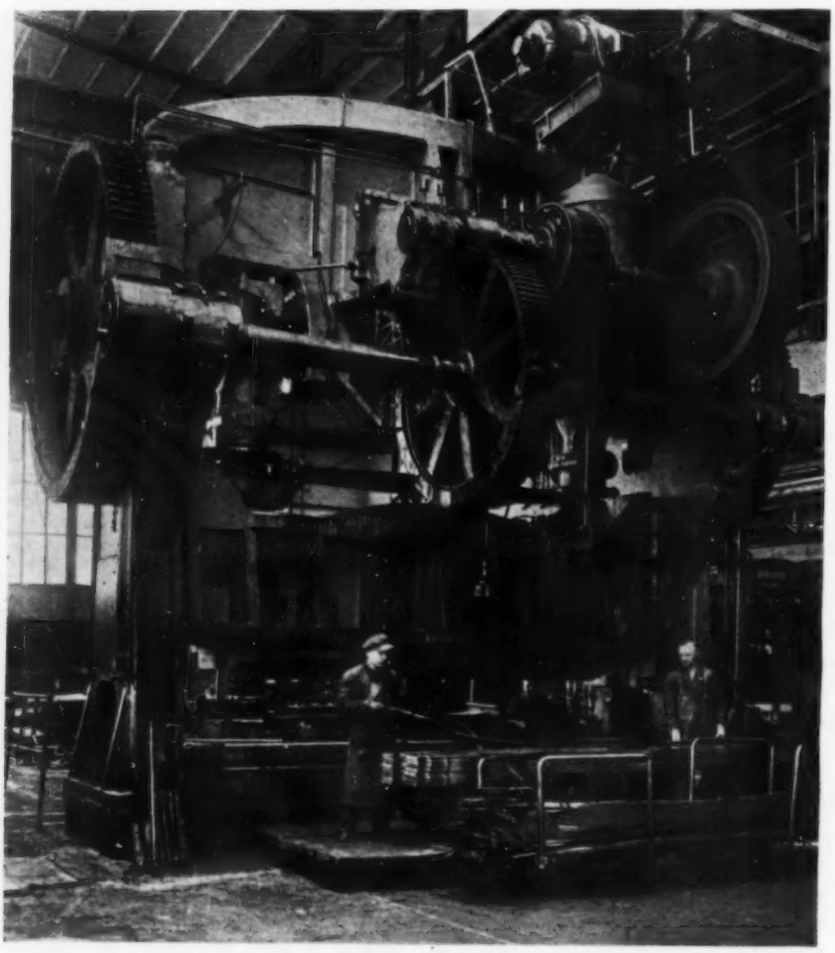
Although open dies are not as troublesome as solid types, rough surfaces and oxidation will contribute toward erratic hardening results. It should be remembered that the smoother the impressions are the freer metal will flow in the heading operation, and the smaller the danger of small tool marks picking up particles of metallic scales. Impressions similar to the ones shown at *C*, in Fig. 3, should have plenty of draft, otherwise thin layers of surface metal will break out as shown in the sketch below.

Other elements rather than heat-treatment which contribute to longer tool life are as follows: physical condition of the punch and die holders, grade of heading wire used, skill of the heading machine operator and grinding of the tools. It is sometimes necessary to grind the face of the punch or die. Should this be attempted hurriedly by applying too much pressure with the grinding wheel, it will cause fine surface cracks to form; these minute cracks will later break out after a short period of service, rendering the tool useless. A soft coarse wheel should be used with light cuts and a slow feed.

Ambi-Budd Builds Body and



Three principal sections of the Ambi-Budd welded body and frame combination before final assembly. The spot welded floor, shown in place, ties the light frame rigidly together



One of the big Hamilton presses blanking out frame side members

A DEVELOPMENT in all-steel automobile body building quite different from anything to be found in the United States has been in production at the Johannisthal plant of Ambi-Budd Presswork for about two years. The car manufacturers who get this type of body from Ambi-Budd have only to drop an engine into the front end of the frame and put on the axle and transmission units to complete a car that is extremely light according to American standards but amply strong to withstand abuse.

As indicated by the name the Ambi-Budd company is affiliated with the Edward G. Budd Manufacturing Company of Philadelphia. The personnel is German. As shown in the illustrations Keller machines are used for sinking big dies, and several of the biggest presses are of American manufacture. The machine tools, however, which are of the contract shop variety, are German.

Thanks largely to the stimulation of the German automobile industry which has been effected through the regulation that permits a new car buyer to deduct the cost of it from his income for tax purposes, as well as the elimi-

Frame Integrally

German Budd affiliate has developed a very light all-steel welded body and frame in one unit for the low-powered cars in vogue there

nation of the rather high taxes formerly charged on new vehicles, the Ambi-Budd plant is busy. Production is at the rate of about 100 bodies per day and 2,600 men are employed. The average rate of pay is 1.20 marks per hr., and the working week is 48 hours.

Because the lots are small compared with the lots put through in an American body plant, die cost is a problem. It does not pay to make dies for some of the small runs and the result is that considerably more hand work is necessary.

Another thing that strikes an American observer forcibly is the amount of piled up parts waiting processing at various points. This accumulation is particularly noticeable at the welding machines. The reason, of course, is that press runs, to be economical, must turn out enough work to warrant the set-up cost of the press, and may consequently produce enough parts to supply the assemblers for several weeks.

Top—Jig used for welding frame assembly. In the foreground a pile of side member subassemblies, at the lower right some tubular cross members, and in the center a finished frame with floor in place

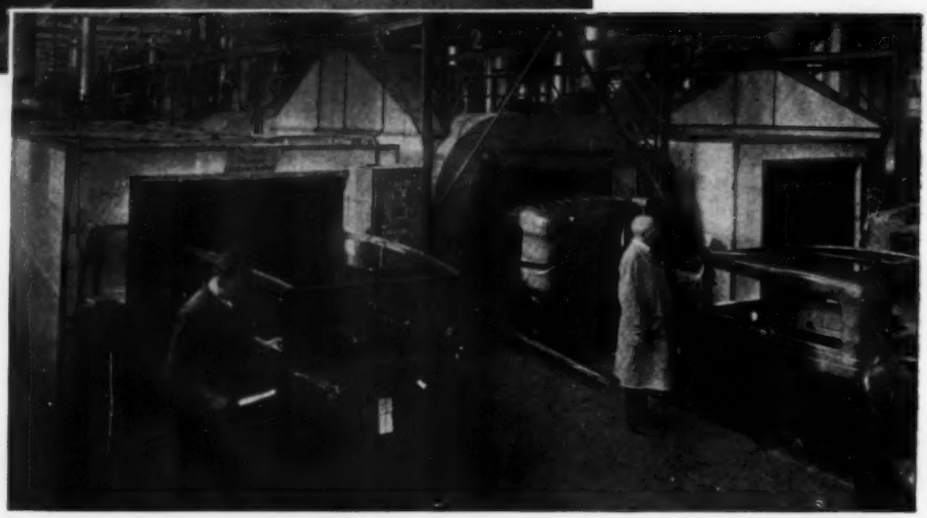
Center—Spraying finished frames

Left—Rear body member being assembled to frame in jig

. . . *Ambi-Budd Builds Body and Frame Integrally*

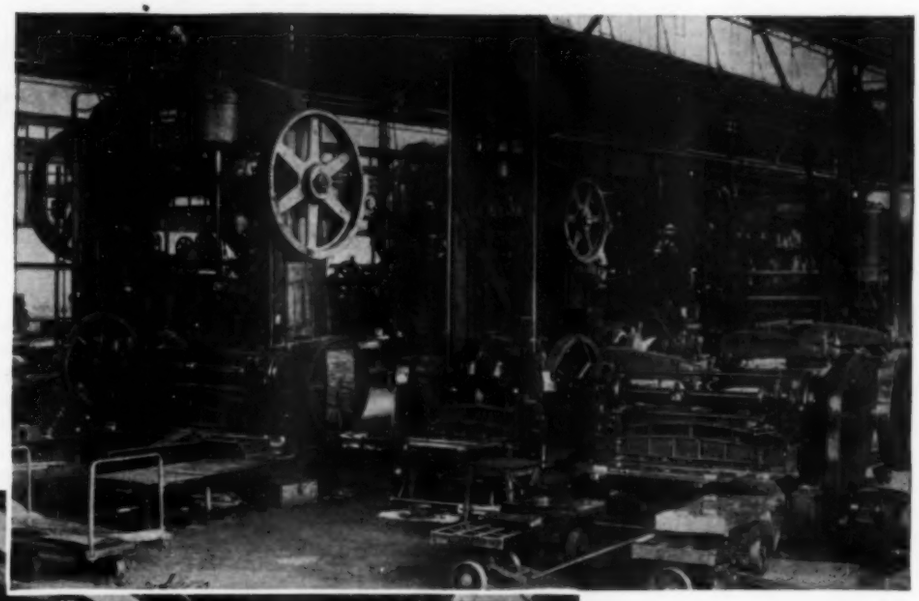
Left — Inspecting the finished bodies as they come down the line from the trimming operations

Below—Bodies entering the lacquer tunnel and emerging from the drying oven



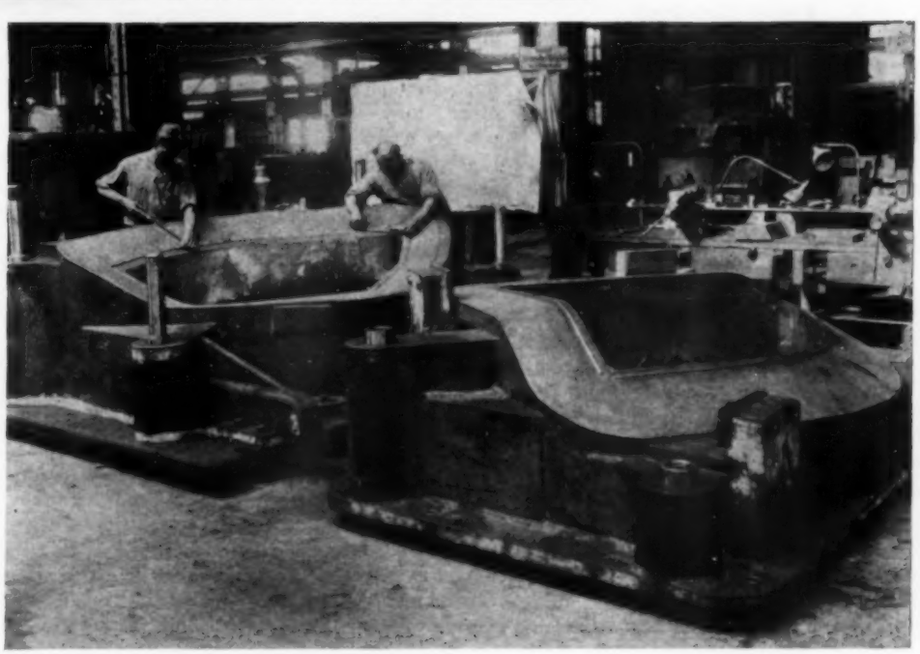
Lower left — Machine work on a big die under a radial drill

Lower right—Kellering a body die from a wood and plaster pattern



Presses and other sheet working equipment in the high bay shop

General view of the low bay machine shop showing vertical milling machines in the foreground



Final hand finishing on one of the halves of a husky die

Profit From Apprenticeship?

A. W. FORBES
Forbes & Myers

I HAVE copies of two indentures, written in the same town, Chelmsford, "in the Province of Massachusetts Bay in Newingland," and at about the same time, 1758 and 1777. These indentures make an extreme contrast, but both are on a sound business basis, as should be the case today. The first offered the boy in return for his services, food, clothing and shelter, care in case of sickness, and on the completion of his "term of time" a substantial payment of money and "two goode suies of apparel." The second offered nothing but instruction. The apprentice was to pay for his food, washing, etc., either in money or in labor additional to what was expected as an apprentice.

The first indenture failed to mention any instruction along the line of the occupation to be learned. It seems to have been assumed that any boy who worked on a farm for four years, doing any task which the farmer desired, would secure a good all-around knowledge of farming. The second indenture promised instruction as far as the master was capable of giving it and the apprentice of receiving it.

Value Received

Both were fair business contracts. Where the value of the instruction was little, a money payment balanced the account. Where it was greater no payment was required. In other contracts of the time, the instruction was considered of greater value than the services, and a money payment was required by the apprentice. It is equally important to keep to the principle of a fair business contract in modern apprenticeship. The boy has labor to sell and wishes to buy education. Each should be appraised at its fair value, and the difference should be the money payment.

It is not necessary that each month should yield a profit to the employer. The program should be considered from a broader point of view. But certain ideals, frequently expressed, exert a pernicious and demoralizing influence. One of these is that the employer should wait until after the completion of the apprentice contract before he gets his profit from it. The objection is that sometimes he does. In many cases an apprenticeship can be planned in such a way that the graduate is a valuable man for the particular employer who did the training, but to no one else. He can be taught the particular methods that the company uses, without the principles that make it possible to apply the knowledge elsewhere.

Narrow Training

I frequently meet young men who have been through a carefully planned training program (I meet them particularly from one company that boasts that it makes no profit on its apprentices) but who, on trying to change to some other company in the search for greater opportunities, find that their training is not wanted. With such a course, a company can overpay its apprentices, and easily get back the profit many times over in later years.

The same effect may result when there is no intention of securing any unfair advantage. Of two companies that start with the same purpose, one may only see a particular need in his own plant, and may unknowingly produce the narrow program, while the other may equally unintentionally produce a program of such broad value that all his competitors want his graduates. In a case of this kind, if there is no profit during the course itself, the first employer is likely to find apprenticeship so highly profitable that he extends it, while the second finds it helps his competitors as much as himself and therefore abandons it.

Others admit that apprenticeship should show a profit during the course, but would postpone this profit to the later years of the course. This is also a harmful practice. This is the policy that has produced the binding of apprentices to serve their full term of years, a practice that should be abandoned as a relic of the dark ages. No boy, and few parents, are able to decide whether the apprenticeship program is what they desire or not. Employers should be encouraged to try the boys for a year, and then possibly for another year. But employers are not going to do this. Each trial costs them money. The only way to give each boy a reasonable chance to try out his own ability is to so arrange the apprenticeship program that it will be profitable to the employer from the start.

Apprenticeship should involve a strictly business contract, which yields valuable training to the boy and a consistent profit to the employer. The profit should be large enough to encourage employers to offer programs of value and indirectly to serve as a protection against exploitation.

An Old Timer and His Tools—Discussion

O. D. BRADSHAW
Fredericton, N. B., Canada

I wish to commend Charles Weslow on his article under the title given above (*AM*—Vol. 79, page 237). I believe that articles of this kind are very beneficial to the trade inciting, as they do, pride in one's toolkit, which leads to neatness and accuracy of work. Such articles should appeal to the younger men who have the interest of their work at heart and remind them that many tips can be obtained from the old timers.

Fiber Screw Machine Cams—Correction

The article under the above title (*AM*—Vol. 79, page 265) which called Spauldite, as used for temporary screw machine cams, a fiber, was erroneous. The makers have a different designation for this material, which is a canvas laminated base impregnated with a phenolic substance. They call this Special Brand CG Spauldite. It is also interesting to note that this material has a scleroscope number of 80, which is hard enough to resist wear.

EDITORIALS

VOLUME 79 AMERICAN MACHINST ESTABLISHED 1877 MCGRAW-HILL PUBLISHING COMPANY, INC. NUMBER 12

K. H. CONDIT F. H. COLVIN

EDITORS

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The Supreme Court Speaks

SELDOM has a decision of the United States Supreme Court been awaited so anxiously as the decision on the NIRA test case handed down last week. And seldom has the Court announced a decision so far reaching in its consequences. In effect it tears down that part of the New Deal structure that was based on fine-spun theoretical definitions of interstate commerce. It also puts a stop to indefinite delegations of authority to do almost anything, and thereby casts serious doubt on the constitutionality of pending New Deal bills, such as the Wagner Industrial Disputes Bill and the Black-Connery 30-Hour Week Bill.

Every employer, every employee, every manufacturer, every merchant, every public official and every voter should read the whole statement of Chief Justice Hughes and the concurring opinion of Justices Cardozo and Stone. In these two statements lies the philosophy of representative government as it was established by the Constitution of the United States and as the majority of us believe it should still be.

We quote several passages from these two statements because of their bearing on future legislative efforts of the New Deal. Chief Justice Hughes says:

> "Congress cannot delegate legislative power to the President to exercise an unfettered discretion to make whatever laws he thinks may be needed or advisable for the rehabilitation and expansion of trade or industry."
>
> "If the Federal Government may determine the wages and hours of employees in internal commerce of a State . . . it would seem that a similar control might be exercised over other elements of cost . . . such as the number of employees, rents, advertising, methods of doing business, etc."
>
> "But the authority of the Federal Government may not be pushed to such an extreme as to destroy the distinction, which the commerce clause itself establishes, between commerce among the several States and the internal concerns of a State."

Justices Cardozo and Stone evidently thought Mr. Hughes was too mild. They say, in an opinion written by Justice Cardozo:

> "The industries of the country are too many and diverse to make it possible for Congress . . . to legislate directly with adequate appreciation of varying conditions."
>
> "If this code had been adopted by Congress itself . . . it would even then be void unless authority to adopt it is included in the grant of power 'to regulate commerce with foreign nations and among the several states.'
>
> "I find no authority in that grant for the regulation of wages and hours of labor in intrastate business. . . . Wages and the hours of labor are essential features of this plan, its very bone and sinew. There is no opportunity in such circumstances for the severance of the infected parts in the hope of saving the remainder. A code collapses utterly with bone and sinew gone."

Hopeful words these for many who have wondered whether constitutional government was to continue. In the long run they promise the reassurance which business has sought. For the immediate future they will surely lead to confusion. Business had adjusted itself as well as it could to the code system which has been wiped out in an hour. It must now readjust itself quickly to a new situation.

In making this readjustment every effort should be made to hold on to the sound features of the NIRA, and to consolidate the gains that have been made. The administration has asked for cooperation to this end, and business leaders have promptly seconded this plea. Many of them have already announced their adherence to code standards of wages and hours. In so doing they have set an example that all business should follow. Business will save itself, its employees and the country much trouble by seizing this great opportunity and proving that it can shoulder responsibility in time of need.

Two Good Resolutions

TWO of the resolutions adopted at the meeting of the National Machine Tool Builders' Association prove that the members of that body are fully aware of the job ahead of them. One resolution authorizes the Board of Directors to reinstate the old committee on apprenticeship and training, the other instructs it to establish an advisory committee on merchandising problems.

No one who is at all familiar with the current labor market will question the need for a committee on training in an industry that demands the highest grade of skill in the metal-working field. Estimates from various responsible sources put the shrinkage in the number of skilled machinists during the depression at thirty-five per cent. Couple with that shrinkage the almost complete abandonment of true apprentice training schools, through force of circumstances, and you have the basic reasons for the threatened shortage of proficient workmen which is worrying the production heads of machine-tool companies. A real job faces this committee.

Of equal importance today is the general question of sound merchandising of machine tools. Five years of depression and discouragement have worn down the salesmen of the industry and some of them are showing a disturbing lack of initiative in following up leads that are convertible into orders today. Something should surely be done to correct this condition. The best brains of the machine-tool industry will be needed for the job.

. CHIPS .

Washington—Supreme Court knocks out NIRA, Frazier-Lemke Act and removal of federal commission members for other than legal causes . . . Richberg announces suspension of NIRA enforcement . . . Roosevelt wins first round of Bonus Bill fight as his splendid veto message on the Patman Bill, delivered in person before House and Senate, is sustained by the Senate . . . Bonus forces rally to gain ends by other means . . . First billion under the Works Bill is approved by President . . . Non-federal projects will get 45 per cent grant from Works Fund and pay 3 per cent interest on balance . . . Following time-honored tradition Vice-president Garner urges revision of Senate rules . . . Secretary Ickes takes a general crack at the Chamber of Commerce and is promptly answered, in considerable and devastating detail, by President Sibley . . . Controller General McCarl demands closer control of TVA expenditures and stirs up Senator Norris.

Foreign—Hitler upsets opposing statesmen by stating, with evident sincerity, Germany's peaceful aims . . . Japanese troops enter demilitarized zone in North China "to punish bandits," retire, threaten to march on Peiping and Tientsin . . . German courts fine nuns and monks caught smuggling funds out of Germany . . . Reich calls classes of 1914 and 1915 to the colors, Nov. 1 . . . At Geneva Mussolini agrees to peaceful settlement of Ethiopian question, at Rome delivers warlike speech to members of his party and calls 20,000 technical experts to the colors . . . Nazis have sterilized over 50,000 in effort to stamp out hereditary disease . . . Germany army to be motorized on basis of one car for every two infantrymen . . . Stalin dissolves "Old Guard" of Reds . . . Baldwin backs Hitler plea for air Locarno.

Finance—Bank of France raises discount rate frantically in desperate effort to save the franc . . . Treasury asks bids on $100,000,000 bonds at 3 per cent, first such offer since 1911 . . . Will offer notes shortly in exchange for some $700,000,000 maturing in June and August . . . To pay off $300,000,000 of 4th Liberty Loan bonds.

Industry—Ford has "indicated profit" of nearly seven millions for 1934, restores $6 minimum wage and goes to five-day week . . . Green threatens general strike as he advocates extension of NIRA, Wagner Bill and 30-Hour Week Bill in speech to 50,000 labor delegates . . . U. S. Steel offers group insurance to employees in amount of over $400,000,000 . . . Industry takes death of NRA with mixed feelings . . . Leading manufacturers announce adherence to wage scales and code hours . . . Fear of chiselers drives some industries to seek means of obtaining price stability . . . Many express hope that some constitutional NIRA substitute can be worked out . . . Shipping tie-up on West Coast threatened as talk of strikes and lockouts spreads . . . ICC orders railroads to stop payments of switching fees to shippers.

Trade—Secretary Hull signs reciprocal trade treaty with Sweden under which Sweden cuts duty on 21 American articles and gets lower tariffs here on various alloy steels and on flat and rolled bars . . . April automobile sales set record for any month since August, 1929.

Indicators—Steel production drops a little . . . Electric power output off but above last year . . . *Business Week's* index steady at 63.8.

Supreme Court Cracks Down on New Deal Legislation

WASHINGTON—Three strikes are out in baseball but not in politics. The Supreme Court's triple ruling against New Deal policies on May 27 left administration supporters groggy but still in the ring.

The unkindest blow was the sweeping 9-to-0 decision against the validity of the National Industrial Recovery Act on the grounds that it involved unconstitutional delegation of authority and that it was administered with unconstitutional application to intrastate commerce.

Washington brain trusters were stampeded into talking of other means of achieving their "objectives," which heretofore have been relegated to the background. These have now come out as (1) shorter working hours for all; (2) higher wage levels for all now below "parity"; (3) higher farm prices; (4) no big profits; (5) no speculative profits at all; and (6) a cumulative drain on big fortunes with no chance for such accumulations in the future.

In a press conference held last Friday the President himself deplored the Supreme Court's decision on NRA. The ruling as related to delegation of authority was not serious in the President's opinion as this may be taken care of by more specific legislation, but the interpretation of intrastate versus interstate commerce put us back in the "horse and buggy age."

Basis Misunderstood

Nine out of every ten suggestions submitted to him following the Court decision failed to appreciate this basic aspect of the problem. The President said that four out of the five national activities were put beyond the scope of Federal legislation by the Court's decision. Transportation could be dealt with but construction, mining, manufacture and agriculture were by their very nature performed in one spot. Under the interpretation that these four activities are not interstate commerce the President questioned whether the agricultural adjustment legislation, the securities act, stock exchange act and labor legislation would survive a court test.

He contended, however, that the decision clarifies the issue as to whether the Federal Government has the right to enter into any national economic problem or to try to better social conditions. He was extremely pessimistic on voluntary cooperation, saying that 90 per cent of the companies in an industry might fall in line, but the other 10 per cent would not. In such cases all bases of agreement broke down as manufacturers are forced to meet competition for self-preservation.

Some administration leaders seem to think that something must be done by June 16, expiration date of the original act, although, with it already emasculated by the Supreme Court, it would appear that soundness would be of more value than speed. Probably because of his statements that the NRA essence could be salvaged in legislation that would pass a court test, former Administrator Hugh S. Johnson was recalled to Washington to hammer out a new proposal.

Attempts to Stampede

Labor leaders have attempted to stampede Congress into hasty legislation by claiming wage cuts and lengthened working hours. There is little foundation for such contentions; industry in general has voluntarily refrained from drastic changes of this sort. Many large corporations have publicly announced adherence to code standards, and trade associations are working for agreements toward this end in a large number of industries.

The school of thought demanding immediate action does not embody all the New Dealers by any means. Another group would defer action for several months to see the result and would be guided accordingly. Still another school would abandon the whole idea as a bad job and cease tampering with economic laws so far as industry is concerned.

Some observers point out that had NRA been confined to interstate business and kept on the permissive basis, apparently intended in the statute as written, the control it envisioned would still be in force. Mandatory application and insistence on invading every butcher shop got NRA into trouble.

Other wild swings that threw the Administration back on its heels were incorporated in the findings against the Frazier-Lemke Act and the ruling that the President could not remove a Federal Trade Commissioner without cause. So far as their importance to industry is concerned these decisions were far overshadowed by that applying to NRA but are clear indications of the Court's temper.

An immediate effect of the rulings will be the recasting of many of the bills now in the legislative mill. Even with expert alteration it is hard to see how the rigid controls sought in previous New Deal statutes can be obtained. The occasion may provide a graceful way out for sponsors of economic reforms who were finding them unworkable and beginning to become a bit embarrassing.

Foundry Equipment Orders Rise Sharply

A two-thirds increase in net orders for April as compared with March is reported by the Foundry Equipment Manufacturers Association. The April index soared to 113 as contrasted with 68 for March. Shipments dropped to 69.7 from 82.6. Unfilled orders rose to 86.1 from 43.2 in the preceding month. The three months' moving average was 86 for April, 77.2 for March and 69.7 in April, 1934. Twenty-two companies reported.

Labor Shortage Found in the Metal Plants

According to a study made by the National Industrial Conference Board, a shortage of 1,193 skilled workmen was reported by 287 metal manufacturing companies employing 115,260 wage earners. In the metal working industry as a whole the shortage of skilled workers is estimated at 19,034. If this industry resumes normal operations, the shortage of skilled workers would be increased to 123,357, according to the board. Among the factors cited for this shortage are the tendency to develop operators for special machines in place of all-around mechanics; abandonment of their occupations by skilled workers; deterioration in skill through prolonged unemployment; inadequate apprentice training before the depression, and competition by government projects through higher wages.

Leipzig Trade Fair Will Open in August

The Leipzig Trade Fair will be held from Aug. 25 to 29, inclusive. Buyers from 75 countries will attend and the newest art and industrial products of 22 producing countries will be on exhibition. American offices of the Fair are at 10 East 40th St., New York.

Sentiment and Resolutions Indicate Optimism of Machine Tool Builders

More hopeful than they have been in years, some 150 machine tool builders gathered at the Edgewater Beach Hotel in Chicago, May 22 and 23, for their 33rd spring convention. Plans for the Machine Tool Show which is to be held in Cleveland, Sept. 11-21, and which will be the largest exhibition of industrial equipment ever staged in this country, were discussed. The various speakers brought statistical, financial and commercial information to show that the future of the industry is truly encouraging. And the convention passed two resolutoins that would hardly have been considered at a time when business was lacking.

The first of these resolutions aimed at the reinstatement of the old committee on training and apprenticeship. The other authorized the appointment of a committee to study and advise on the merchandising problems of the industry. A third resolution, passed unanimously, urged on Congress, if such action was thought necessary, an extension of NIRA for one year on a permissive basis, but in such form that if the present act should be found unconstitutional the extension would die with it.

In his presidential address Charles J. Stilwell made an earnest plea for improvement in the selling and sales promotion activities of the industry. He illustrated his points by citing actual experiences on both sides of the buyer's desk. His plea led to the resolution referred to above.

Coming Out of Depression

Dr. Alexander Sachs, former economist for NRA, quoted statistics to show that we are emerging from a secondary post-war depression and that the outlook for good business for the capital goods industries is exceptionally bright. Logan Anderson, of the Lakeside Press, showed examples of effective advertising copy and attractive plain and color printing in an effort to persuade technical advertisers to humanize their advertising. Kenneth H. Condit, editor, *American Machinist*, presented briefly the results of the 1935 Inventory of Equipment in Metal-Working Plants, and urged machine tool builders to use this survey as a practical sales tool.

W. P. Kirk, Pratt & Whitney Co., and Roberts Everitt, Exposition Manager, reported on the progress that has been made in building up the Machine Tool Show and explained the various promotion pieces. Mrs. Frida F. Selbert, Secretary of the Association, showed by charts the extent to which the industry has recovered from the low point of the depression, and what effect the depression has had on the various financial ratios of member companies.

Col. Frank Knox, president, "Chicago Daily News," addressed the convention on national issues and made a plea for more extensive growing of "industrial" crops on our farms. George P. Torrence, president, Link-Belt Co., talked on costs and cost finding as a science and presented figures from his own company to show the variation in the important cost factors that occurs as business volume steps up from 50 to 75 per cent and thence to 100. He pointed out that on a piece of machinery, bought on a basis of one year liquidation, a variation in price of 10 per cent, up or down, means only about one month, more or less, in the liquidation period.

Industry Problems

Herman H. Lind, general manager of the Association, gave a clear picture of the present situation in the machine tool industry. He said, in part:

"This industry is in position to capitalize on the obsolete condition of manufacturing plants by pushing to the limit the more efficient machines it is now producing. The customers of this industry have practically arrived at a point where they want to be sold. It might also be said that they really want to buy, but ordinarily a buyer does not wish the seller to know that he must or really wants to buy. However, due to the wide knowledge of the prevalence of obsolete equipment and the opportunities for products at reduced prices, I am convinced that many of the customers of the Machine Tool Industry want to be sold.

"While an aggressive effort for sales is being made, the profit viewpoint must not be lost. Although this industry serves mass production, the Machine Tool Industry itself is not a mass production industry. Ours is not an industry in which an individual plant can count upon great expansion of volume as the main factor in building up profits. True, we must have in each plant a certain volume to clear the overhead and, theoretically, profits should mount rapidly as volume increases after the overhead has been covered. However, due to the terrific fluctuations in volume of sales over relatively short periods of time to which this industry is subject, a part of this apparent profit after the overhead is cleared must be recognized not as real profit, but as over-absorbed burden. In order not to deceive himself every manager of a machine tool plant should see that the financial statements for his company carry a fair calculation of the over-absorbed burden to compensate in some measure for the heavy losses which have been suffered.

"A further important consideration that must constantly be kept in mind in these times is the service nature of the industry. This industry was built on the basis of its accomplishments and its willingness to serve other manufacturers. In promoting its business no effort has been too great for it to make for its customers, and it has even permitted itself to be subjected to most unfair demands. It has given freely of its knowledge and experience, practically for the asking.

"While one is anticipating the great potential market for new machinery resulting from known obsolescence, he cannot but feel considerable apprehension due to the personnel situation in our industry. As nearly as we can see, the industry is short approximately 35 per cent of the skilled mechanics it employed in 1929. A back-log of orders that will permit giving workmen some assurance of steady employment will bring some unknown proportion of these back to the industry.

"All the resourcefulness of any plant and, for that matter, the entire industry, is not too much to concentrate on this problem. For our capital is tied up in our plants. It takes men to build the machines, it takes time to make the men, and it is not too early to be aggressive in this direction."

Officers Nominated for Metals Society

The nominating committee appointed by B. F. Shepherd, president of the American Society for Metals, met May 20 and nominated the following slate of officers to be acted upon at the next annual meeting: for president, R. S. Archer, Republic Steel Corp.; for vice-president, E. C. Bain, U. S. Steel Corp.; for treasurer, W. P. Woodside, Molybdenum Corp. of America, and for trustees, R. L. Kenyon, American Rolling Mill Co., and S. C. Spalding, American Brass Co.

Auto Production Slackens But Machinery Inquiries Improve

DETROIT—With an estimated loss of 60,000 in production due to the Chevrolet Toledo strike, it seems unlikely that the May output approached the 477,546 units turned out in April. In the third week in May Chrysler units were reported, however, as holding steady at near peak production as are Olds, Pontiac and Buick. The return of the Toledo strikers to work enabled Chevrolet again to reach capacity the latter part of the month. Ford output was running somewhat under April with a reduction to five operating days in place of six. Output for the week ending May 25 again exceeded 100,000 for the first time since the Chevrolet strike began.

Last year the production peak came in May and that of sales in June. In 1933 these peaks were in June and July, respectively. In March 302,980 new cars and trucks were registered and the April figure is expected to top this by some 60,000 units. Truck sales were running considerably higher than last year. May sales display a mixed tendency, up one week and down the next. Within the last three weeks, reports of sales exceeding those of the previous week are conspicuous by their absence.

Parts Suppliers Slacken

Schedules of parts suppliers were reported as easing off slightly, indicating a belief that the peak is near. Preliminary estimates by the U. S. Department of Commerce indicate an increase in April over March in retail financing of 17.8 per cent, which is the lowest March-April change in several years. In 1929 an increase of 19.9 per cent was recorded. Foreign trade agreements are reported by the same authority as helpful to automotive exports, which in the first quarter of this year exceeded those of last year by 40 per cent and in 1933 by 21.6 per cent.

Restoration of the $6 a day minimum wage by the Ford Motor Company on May 21 brought the minimum back to what it was in 1929. The average hourly rate for the year ending March 31, 1935, as reported by A.M.A. membership, was 75.7c., which for an eight-hour day totals $6.06.

With the White Motor Co. closed by a strike, some 300 productive workers reported out at Dodge in sympathy with the dingmen, the right and left wing bitterness in the Toledo Union, and President Green's hint of a general strike unless the Wagner and Black 30-hour bills are passed, the outlook for industrial peace in the industry is problematical. Some cancellations were reported as a result of the Senate passage of the Wagner bill but whether this is at all extensive is not yet evident.

The strike of 100 out of 430 in the trim department of the Packard 120 shops ended on May 22 after lasting officially for four days. Over half of these men were back, however, before the M.E.S.A. ended the strike. Replacing five short-service men in the 120-trim department with an equal number from the big-car department with longer service records led to the difficulty. The misunderstanding could easily have been adjusted through the bargaining council set up by the Auto Labor Board.

The officers of the Association of Automobile Employees on May 20 made its second request to President Roosevelt for removal of Dr. Leo Wolman and Richard Byrd of the Auto Labor Board, thus continuing organized labor's opposition.

Wood pattern makers are reported very busy with a scarcity of good workers, which is indicative of activity in experimental work. Metal pattern making is still slow as small tools and dies have not yet reached the production stage. This period should be about five to six weeks away because this lag usually exists between large and small die work. Sufficient evidence exists that the October 1 introduction date is being taken seriously, and a good year is anticipated in these lines.

Absence of apprentice training in tool and die making is being felt. In peak periods men are hired who are not skilled operatives, but must be paid almost as much in order to get them. This break-down in the usual wage differential between the highly skilled and less skilled breeds resentment.

Machinery prospects are reported as very bright with inquiries ahead of April. The lull will be shorter this year than usual with new model preparation on the upgrade and the expansions mentioned earlier. Nash is the first to announce a new model.

• INDUSTRIAL REVIEW •

• Most of the important machinery centers of the country report fair to good business for the month of May. The outlook for June, July and August is for some recession but the general feeling is that it will be less severe than has been the case for several years. Every one is wondering what the effect of the Supreme Court decision killing the NRA will be but machinery men believe that more good than harm will come from it.

• Boston sources report a fairly satisfactory volume of business in May and good prospects for the near future. In Philadelphia there was real improvement during the month, while in New York the orders of the last half more than offset a rather poor start. Business held up reasonably well in Pittsburgh but a considerable drop is anticipated in that district during the summer months.

• May volume in Detroit recovered some of the ground lost in April. Because of the change in the automobile show date summer business is expected to be better than usual. Toledo is experiencing a distinct lull and improvement is not looked for until late in the summer. Indianapolis, on the other hand, is quite optimistic because of good May orders and lack of any signs of tapering off.

• Cincinnati found orders fewer in May after a good April and expects quiet business until perhaps the first of August. St. Louis also seems to be having a dull time after a fairly satisfactory month. Inquiry has fallen off somewhat. Chicago had a satisfactory May and expects a steady improvement to start in August after a quiet June and July.

• The Pacific Northwest is plagued with strikes in the logging camps and lumber mills and is afraid of trouble with the maritime unions. Despite these handicaps orders for machine tools have been good, particularly in the second-hand market. From California comes word that May was not so good as April. The Supreme Court decision is taken as a favorable factor that should relieve the dread of dictatorship and result in the release of orders.

P. A. McKittrick Heads Air Conditioning Group

More than 40 representatives of Air Conditioning Manufacturer's Association met at Hot Springs, Va., on May 23 and elected officers for the coming year. The meeting was presided over by P. A. McKittrick of the Parks-Cramer Co., who was elected president. J. F. G. Miller, of the B. F. Sturtevant Co., was elected vice-president.

Widely Varied Program Awaits A.S.T.M. Members

Fifteen sessions are scheduled by the American Society for Testing Materials for the 38th annual meeting to be held in Detroit, June 24-28, at the Book-Cadillac Hotel. Included in the program are 48 technical papers and 45 reports from various committees. The tenth Edgar Marburg lecture will be delivered by Dr. L. B. Tuckerman, assistant chief, division of mechanics and sound, and principal scientist of the National Bureau of Standards. His subject will be "Aircraft: Materials and Testing." The following nominations have been announced: for president, H. S. Vassar, laboratory engineer, Public Service Electric & Gas Co., Irvington, N. J.; for vice-president, A. E. White, professor of metallurgical engineering and director of department of engineering research, University of Michigan; for members of the executive committee, W. H. Graves, chief metallurgist, Packard Motor Car Co.; R. L. Hallett, chemist, National Lead Co.; N. L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co.; H. H. Morgan, manager of the rail and fastenings department, Robert W. Hunt Co., and W. R. Webster, chairman of the board, Bridgeport Brass Co.

German Tool Exports to U. S. Decline in 1934

During 1934 the value of tool exports from Germany to the United States declined to 42 per cent of that for 1933. In metric tons the trade was down to 401 tons valued at 1,014,000 Reichsmarks as against 1,073 valued at 2,400,000 Reichsmarks in 1933. Germany's export trade in tools to countries other than the United States was well maintained, total shipments amounting to 16,387 metric tons valued at 40,044,000 Reichsmarks in 1934, against 16,818 metric tons valued at 45,334,000 Reichsmarks in the preceding year. These figures were supplied in a report from Vice-Consul James H. Wright at Cologne.

Program Announced for A.S.M.E. Summer Meeting

Problems of production, machine shop operation, and power will be discussed before the semi-annual meeting of the American Society of Mechanical Engineers to be held at Cincinnati, Ohio, June 17-21. Headquarters are at the Hotel Gibson. Ralph E. Flanders, president of the A.S.M.E., and president of the Jones & Lamson Machine Co., will be the principal speaker at a dinner meeting on Thursday evening at 6:30. A feature of the dinner will be the presentation of the Holley Medal for 1934 to Irving Langmuir for the development of gas-filled incandescent lamps and for research in oil films. Persons going to the meeting can also take in a trip to the Norris Dam on June 22.

Papers of interest to the metal-working field are as follows:

Wednesday, June 19

2 p.m.: Railroad-Machine Shop Division; chairman, W. A. Winterrowd—"How Can Railroad Shops Justify the Use of Modern Machine Tools and Methods," by A. Sellers, Jr., Sellers Machine Tool Co., and "Railway Equipment Maintenance," by L. D. Freeman.

Thursday, June 20

9:30 a.m.: Quality Control; chairman, F. M. Skinker—"Quality Control in Manufacturing," by J. F. Feely, Western Electric Co., and "Effective Handling of Quality Complaints," by Harry Benson, Cheney Brothers.

Friday, June 21

9 a.m.: Machine Shop—I; chairman, R. E. W. Harrison,—"Influence of Cutting Fluids on Tool Life in Turning Steel," by O. W. Boston, W. W. Gilbert, and C. E. Kraus, University of Michigan, and "Machine Tool Electrification," by P. McShane, Westinghouse Electric & Mfg. Co.

2:30 p.m.: Machine Shop—II; chairman, E. A. Muller—"Today's Machine Tool Problems," by Sol. Einstein, Cincinnati Milling Machine Co.; "Why Standardization Pays," by John Gaillard, American Standards Association, and "Economic Situation in the Machine Tool Industry," by H. H. Lind, National Machine Tool Builders' Association.

Reciprocal-Tariff Treaty Signed With Sweden

Since foreign trade is a concern of the Federal Government, it is unlikely that the Supreme Court decision on the NRA case will affect the reciprocal-tariff program. The basis for the belief is that flexible tariff provisions have been held constitutional because they were written into the Fordney-McCumber and Hawley-Smoot Tariff Acts of 1922 and 1930, permitting the President under certain conditions to raise or lower rates as much as 50 per cent. Moreover, under the reciprocal-tariff program approved by Congress on June 12, 1934, the President was granted only specific and limited administrative powers. He may raise or lower tariffs by 50 per cent, but no product may be moved on or off the free list.

In the reciprocal-tariff treaty signed May 25 with Sweden, and to be in force for three years, that country binds herself to make no changes in rates applying to American metal products. Trade between the United States and Sweden has been closely balanced. For example, in 1934 we bought Swedish goods in the amount of $33,900,000 and sold products worth $33,000,000 to Sweden. The trade was at a level 60 per cent of that in 1929. During the year Sweden accounted for 1.8 per cent of our total foreign trade, and as a market ranked nineteenth in importance. American exports to her consisted of industrial machinery, $842,000; office appliances, $917,000; agricultural machinery and implements, $252,000; motor vehicles, parts and accessories, $6,229,000. Concessions obtained by the United States total 64 items as follows: duty reductions, 21 items; binding of present rates, 27 items; binding on the free list, 16 items. The accompanying table gives a list of metal products on which the United States granted concessions to Sweden.

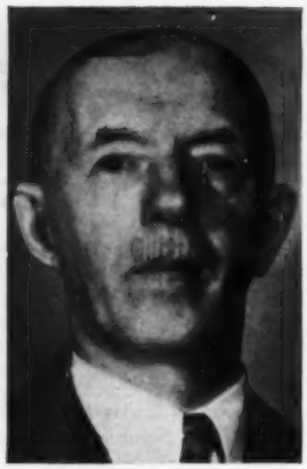
United States Concessions to Sweden

Article	Rates of Duty		Percentage Reductions
	Old	New	
Electric vacuum cleaners and motors	35% ad. val.	35% ad. val.	None
Machine knives	20% ad. val.	20% ad. val.	None
Reciprocating gang saw machines	27½% ad. val.	27½% ad. val.	None
Forks, hoes and rakes	15% ad. val.	15% ad. val.	None
Anti-friction ball and roller bearings	10c per lb. + 45% ad. val.	8c per lb. + 35% ad. va.	—21%
Mill, pit, drag and steel band saws	20% ad. val.	12% ad. val.	—40%
Crosscut, hack and bandsaws	20% ad. val.	15% ad. val.	—15%
Calculating machines with motors	35% ad. val.	25% ad. val.	—29%
Pliers other than slip joint, valued at over $2 per doz.	$1.20 per doz. + 60% ad. val.	0.80c per doz. + 40% ad. val.	—33⅓%
Files, 7 in. and over	77½c per doz.	45c per doz.	—42%
Machines for making paper and pulp	27½% ad. val.	20% ad. val.	—27%
Alloy steel, 3½ to 8c per lb	6% ad. val. plus present specific rates on alloy contents	4% ad. val. plus present specific rates on alloy contents	—20%

D. B. PERRY

C. J. KENERSON

A. M. CANDY



F. H. STREINE

• PERSONALS •

D. B. PERRY has been elected president of the Morse Chain Co., Ithaca, New York and Detroit, Division of Borg Warner Corp. Other officers are: C. J. KENERSON, vice-president, general manager and treasurer; N. K. VAN OSDOL, secretary and assistant general manager; S. B. WARING, assistant secretary and assistant treasurer. FRANK M. HAWLEY was appointed sales manager of the automotive division and manager of the Detroit plant.

A. M. CANDY, associated with Westinghouse Electric & Manufacturing Co. for many years as welding engineer, has been appointed consulting engineer of the Hollup Corp., 3357 West 47th St., Chicago, Ill. Mr. Candy will engage in development of welding machines and other equipment.

FRANK H. STREINE, who was vice-president and general manager of the Streine Tool & Manufacturing Co. for many years and more recently president of the Mill Equipment Co., now heads a newly established steel finishing machinery division of the Mackintosh-Hemphill Co. This work will be carried on at the company's plants at Pittsburgh and Midland, and at Wooster, Ohio.

CLARK R. PHIFFER has been appointed superintendent of the V&O Press Co., Hudson, N. Y. Mr. Phiffer has been in charge of the General Electric toolroom in the refrigerator department for the past several years.

F. W. SKUSA will be in charge of the newly reopened Muncie Products division of the General Motors Corp.

REAR ADMIRAL HAROLD G. BOWEN on May 29 assumed the duties of engineer in chief, and chief of the Bureau of Engineering, Navy Department, Washington.

FRANK J. FREY, vice-president of Geuder, Paeschke & Frey Co., has been elected president. Mr. Frey has been connected with the company since 1883 and succeeds the late CHARLES A. PAESCHKE. He continues as treasurer. Other officers are CHARLES PAESCHKE, JR., vice-president and secretary, and FRANK FREY, JR., vice-president and production manager.

ROBERT E. W. HARRISON, head of the Machinery Division of the Bureau of Foreign and Domestic Commerce and COMMANDER ROBERT J. WALKER, of the Navy Department are visiting all naval yards and stations in the conduct of a survey of equipment.

NEAL W. FOSTER, who joined the NRA more than one year ago, resigned recently to become associated with the Boston Gear Works, Inc., Quincy, Mass.

• OBITUARIES •

MARCUS T. LOTHROP, 49, former president of Timken Roller Bearing Co., died May 23. Mr. Lothrop had been identified with Timken since 1911. He succeeded H. H. TIMKEN as president in 1929, and resigned in 1932.

FREDERICK E. KOHLER, founder of the F. E. Kohler Co., manufacturer of hardware specialties, Canton, Ohio, died May 22 at the age of 79. Mr. Kohler was born in Berne, Switzerland and came to Canton 62 years ago.

MAURICE I. JOHNSON, for many years treasurer and latterly vice-president of Gisholt Machine Co., Madison, Wis., died recently, aged 58. Apart from his duties as an officer of the company, Mr. Johnson gave most of his attention to the management of the Gisholt foundry.

• BUSINESS ITEMS •

The American Electric Furnace Co., Boston, Mass., has appointed the following direct factory representatives: for Ohio and Western Pennsylvania—Anderson-Bolds, Inc., 1836 Euclid Ave., Cleveland, Ohio; for the state of Wisconsin less the western section—W. G. Nichol Co., 711 West Michigan St., Milwaukee, Wis., and for the state of Minnesota and the western section of Wisconsin—Northern Machinery & Supply Co., Lumber Exchange Building, Minneapolis, Minn.

The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, has established a direct sales office in Chicago, to cover its western territory. B. N. BROCKMAN, western sales manager, is in charge of the office, located at 20 N. Wacker Drive Bldg., Chicago, Ill.

The Globe tapping and drilling machine, formerly manufactured by the Globe Tapping Machine Co., Bridgeport, Conn., will be manufactured and sold exclusively by the Dreses Machine Tool Co., 3366 Beekman St., Cincinnati, Ohio.

Pioneer Engineering & Manufacturing Co., formerly at 8316 Woodward Ave., Detroit, has increased its manufacturing facilities and has moved to a larger building at 31 Melbourne Ave.

The Bantam Ball Bearing Co., South Bend, Ind., has let a contract to increase the company's floor space by 60 per cent. A new factory unit of brick and steel construction will be erected.

The V. & O. Press Co., Hudson, N. Y., has completed arrangements with Marshall & Huschart Machinery Co., Chicago, Ill., to distribute its

complete line of plain and automatic presses in the Chicago and Wilwaukee territories.

• MEETINGS •

AMERICAN ELECTRO-PLATERS SOCIETY. Annual meeting and exhibition, June 10-14. Pyramid Temple Mosque, Bridgeport, Conn. H. A. GILBERTSON, secretary, 234 South Wabash Ave., Chicago, Ill.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer convention, June 24-28. Ithaca, N. Y. H. H. HENLINE, national secretary, 29 West 39th St., New York, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Summer meeting, June 19-21. Hotel Gibson, Cincinnati, Ohio. CLARENCE E. DAVIES, secretary, 29 West 39th St., New York, N. Y.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting, June 24-28. The Book-Cadillac Hotel, Detroit, Mich. C. L. WARWICK, secretary,260 South Broad St., Philadelphia, Pa.

GRAY IRON FOUNDERS' SOCIETY. First annual meeting of the Gray Iron Foundry Industry, June 6 and 7. Hotel Gibson, Cincinnati, Ohio. W. H. COLE, secretary, the Moore Bros. Co., Elizabeth, N. J.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, June 16-21. The Greenbrier, White Sulphur Springs, W. Va.

• PATENTS •

May 14, 1935

Metal-Working Machinery

Hydraulic Driver for Machine Tools. Walter Ferris, Milwaukee, Wisc., assigned to the Oilgear Co. Patent 2,001,059.

Reamer Grinder. Edwin R. Zeitz, New Haven, and Stanley W. Dennison, Branford, Conn. Patent 2,001,173.

Electric Arc Welding. Bernard J. Brugge, Cleveland, Ohio, assigned to the Lincoln Electric Co. Patent 2,001,179.

Machine for the Manufacture of Pipes. Leon Bille, Nogent-sur-Marne, France. Patent 2,001,237.

Wire Bending Machine. Frederick Wade Greer, Belmont, Mass., assigned to J. W. Greer Co. Patent 2,001,273.

Metal Cutting Machine. James L. Anderson, Closter, N. J., assigned to Air Reduction Company, Inc. Patent 2,001,294.

Grinding Device. Ervin F. Lawhorn and Sherman R. Brenaman, Lanark, Ill. Patent 2,001,497.

Tools and Attachments

Head Slide for Automatic Machine Tools. Harry W. Rupple, Shaker Heights, Ohio, assigned to the Cleveland Automatic Machine Co. Patent 2,001,586.

Processes

Method of and Machine for Relieving Gear Cutters. August C. Heard, Rochester, N. Y., assigned to Gleason Works. Patent 2,001,021.

Process of Tin Plating. Francis H. Snyder, Niagara Falls, N. Y., and Stanley F. M. Maclaren, Niagara Falls, Ontario, Canada, assigned to Industrial Research Ltd. Patent 2,001,474.

May 21, 1935

Metal-Working Machinery

Automatic Razor Edging Machine. Arthur J. Holman, Brookline, Mass. Patent 2,001,727.

Furnace for Producing Purified Metals. Maurice L. Wood, Waterbury, Conn., assigned to the Chase Companies, Inc. Patent 2,001,808.

Automatic Expanding Machine. George W. Chalmers, Summit, Ill., assigned to International Patents Development Co. Patent 2,001,867.

Machine for Making Metal Wool. Levander Peterson, Chicago, Ill., assigned to James H. Rhodes & Co. Patent 2,001,940.

Metal Treating Apparatus. Raymond J. Wean and Louis D. Peik, Warren, Ohio, assigned to the Wean Engineering Co., Inc. Patent 2,001,948.

Sheet Flash Welder. Arthur F. Hanson, Philadelphia, Pa., assigned to Edward G. Budd Mfg. Co. Patent 2,002,007.

Swaging Means. Harry A. Douglas, Bronson, Mich. Patent 2,002,220.

Grinding Machine. David S. Eastwood, Los Angeles, Cal. Patent 2,002,224.

Column Clamp for Radial Drills. Jack C. Carlton, Cincinnati, Ohio, assigned to the Carlton Machine Tool Co. Patent 2,002,469.

Tools and Attachments

Electrode for Arc-Welding. August R. Nyquist, Roseau, Minn. Patent 2,001,848.

Feed Mechanism for Metal Cutting Machines. William E. Sykes, Buffalo, N. Y., assigned to Farrel-Birmingham Co., Inc. Patent 2,001,987.

Workpiece Guide for Machine Tools. Park Tessky, Esslingen-on-the-Neckar, Germany. Patent 2,002,282.

Rotatable Work Table. Fred R. Swanson, Rockford, Ill., assigned to Sunstrand Machine Co. Patent 2,002,442.

Welding Rod. Gorham W. Woods, Houston, Tex., assigned to Haynes Stellite Co. Patent 2,002,462.

Drive for Machine Tool Elements. Keith F. Gallimore, Fond du Lac, Wis., assigned to Giddings & Lewis Machine Tool Co. Patent 2,002,480.

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Coated Copper Article and Method of Making the Same. Robert R. Tanner, Highland Park, and John S. Thompson, Detroit, Mich., assigned to Metal Finishing Research Corp. Patent 2,001,753.

Method and Material for Producing Phosphate Coating. John S. Thompson and Van M. Darsey, Detroit, Mich., assigned to Metal Finishing Research Corp. Patent 2,001,754.

Method of Cold Heading. Arthur T. Siviter, Detroit, Mich., assigned to Budd Wheel Co. Patent 2,001,981.

Method and Apparatus for Making Sheet Metal Articles. Peter Peterson, Toledo, Ohio, assigned to the City Auto Stamping Co. Patent 2,002,097.

Method of Welding Metal Parts. Francis Earle, Montclair, N. J., assigned to Metal & Thermit Corp. Patent 2,002,222.

Process of Manufacturing Composite Metal Articles. Max R. Trembour, Beaver, and Harry Wilson, Jr., Washington, Pa., assigned to Jessop Steel Co. Patent 2,002,229.

Rubber Coated Steel Object and Method of Making the Same. Elgin Carlton Domm, Niles, Mich., assigned to National Standard Co. Patent 2,002,261.

Rubber Coated Object. Elgin Carlton Domm, Niles, Mich., assigned to National Standard Co. Patent 2,002,262.

Rubber Coated Steel Object. Elgin Carlton Domm, Niles, Mich., assigned to National Standard Co. Patent 2,002,263.

Method of Rolling Strip Material. Charles A. Kral, Steubenville, Ohio. Patent 2,002,266.

Taper Roller Lapping Device and Method. William E. Hoke, Baltimore, Md. Patent 2,002,317.

Method of Producing Seamless Drawn Tubes and Other Tubular Articles. Peter Otto, Dusseldorf-Oberkassel, Germany. Patent 2,002,415.

Method and Apparatus for Making a Can. Harry Sebel, Boston, Mass., assigned to Arthur H. Parker. Patent 2,002,456.

May 28, 1935

Metal-Working Machinery

Grinding Machine. Clement Booth and Andrew Strom, Cincinnati, Ohio, assigned to Cincinnati Grinders, Incorporated. Patent 2,002,489.

Rolling Mill. Gustaf L. Fisk, Pittsburgh, Pa., assigned to Mesta Machine Co. Patent 2,002,531.

Abrading Machine. Charles Johnson, Rockford, Ill., assigned to Mattison Machine Works. Patent 2,002,665.

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Portable Drilling Machine. Karl H. Andred, Milwaukee, Wis., assigned to Artos Engineering Co. Patent 2,002,727.

Machine Tool Transmission and Control. William K. Andrew and Joseph B. Armitage, Wauwatosa, Wis., assigned to Kearney & Trecker Corp. Patent 2,002,728.

Machine for Making Springs. Alfons F. Prange, St. Louis County, Mo. Patent 2,002,754.

Grinding Machinery. Lester F. Nenninger, Cincinnati, Ohio, assigned to Cincinnati Grinders, Incorporated. Patent 2,002,921.

Broaching Machine. Millard Romaine, Cincinnati, and Erwin G. Roehm, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 2,002,924.

Machine Tool. Leo A. Dumser and Oscar W. Floody, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 2,002,938.

Centrifugal Casting Machine and Method. William D. Sargent, Newark, N. J., assigned to Durafer (Inc.). Patent 2,002,962.

Grinding Apparatus. Robert Edwin Spurr, Detroit, Mich., assigned to Chrysler Corp. Patent 2,002,967.

Arc-Welding Power Unit. George T. Southgate, Forest Hills, N. Y., assigned to Union Carbide & Carbon Research Laboratories, Inc. Patent 2,003,057.

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Automatic Grinding Machine. Harry Arter, Worcester, and Warren F. Fraser, Westboro, Mass., assigned to Arter Grinding Machine Co. Patent 2,003,269.

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Honing Tool. Kirke W. Connor, Detroit, Mich., assigned to Micromatic Hone Corp. Patent 2,002,567.

Machine Tool Drive. Herman R. Isler, Norwood, Ohio, assigned to the Cincinnati Milling Machine Co. Patent 2,002,816.

Welding Equipment and Method of Welding. William N. Barrington, Birmingham, Ala., assigned to the American Cast Iron Pipe Co. Patent 2,002,877.

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Apparatus for Making Radiators. James F. McIntire, Detroit, Mich., assigned to U. S. Radiator Corp. Patent 2,002,904.

Reamer Sharpener. Herman W. Zimmerman, Chicago, Ill., assigned to Automotive Maintenance Machinery Co. Patent 2,002,971.

Welding Rod for Applying Protective Abrasion Resisting Facings. Karl Strobel, Whittier, Cal., assigned to Stoody Co. Patent 2,003,020.

Electric Welding Apparatus. George E. Mirfield, Robert E. Lewis and Cyril Firth, Youngstown, and John E. Neale, Girard, Ohio, assigned to the Youngstown Sheet & Tube Co. Patent 2,003,118.

Broaching Tool. Frank F. Graham, Jr., Cardiff, Md. Patent 2,003,144.

Stock Feeding and Gripping Device. Max E. Lange, Cleveland Heights, and William J. Burger, Shaker Heights, Ohio, assigned to the Warner & Swasey Co. Patent 2,003,152.

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Processes

Two-Material Extruded Valve and Method of Making the Same. Eugene A. McBride, Cleveland, Ohio, assigned to Thompson Products, Inc. Patent 2,002,641.

Method and Apparatus for Lining Metal Pipes. James R. McWane, Birmingham, Ala. (deceased), assigned to McWane Cast Iron Pipe Co. Patent 2,002,701.

Process of Protectively Facing Surfaces with Abrasion Resisting Material. Karl Strobel, Whittier, Cal., assigned to Stoody Co. Patent 2,003,019.

American Machinist
REFERENCE BOOK SHEET ©

Welding in Machinery Construction

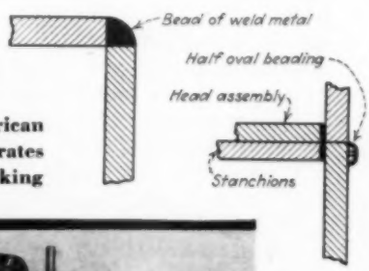
A Tentative Code for Fusion Welding and Flame Cutting in Machinery Construction. Adopted by the American Welding Society, March, 1935

Section 1—General Application

The principal field these specifications are designed to cover is that of machinery and industrial equipment where welded steel structures are substituted for gray iron or steel castings. This code does not cover pressure vessels and piping nor primary steel structures used in bridges, buildings and ships, covered by existing codes or codes in preparation.

Section 2—Definitions

The definitions of welding terms as prepared by the nomenclature committee and aproved and published by the American Welding Society shall govern for any welding terms appearing in this code.



For convenience, some of the more common terms have been included herein, and their specific applications under this code are defined as follows:

1. *Fusion Welding*—The process of joining metal parts in the molten or molten and vapor states without the application of mechanical pressure or blows.

Under this code, fusion welding is restricted to the arc, gas, fusion thermit or atomic hydrogen-welding processes.

2. *Fillet Weld*—A weld of approximately triangular cross-section, whose throat lies in a plane disposed approximately 45 degrees with respect to the surfaces of the parts joined.

The size of a fillet weld shall be expressed in terms of the width in inches of its adjacent fused sides.

3. *Butt Weld*—A weld whose throat lies in a plane disposed approximately 90 degrees with respect to the surfaces of at least one of the parts joined.

The size of a butt weld shall be expresed in terms of its net or unreinforced throat dimension in inches.

4. *Root*—The zone at the bottom of the cross-sectional space provided to contain a fusion weld.

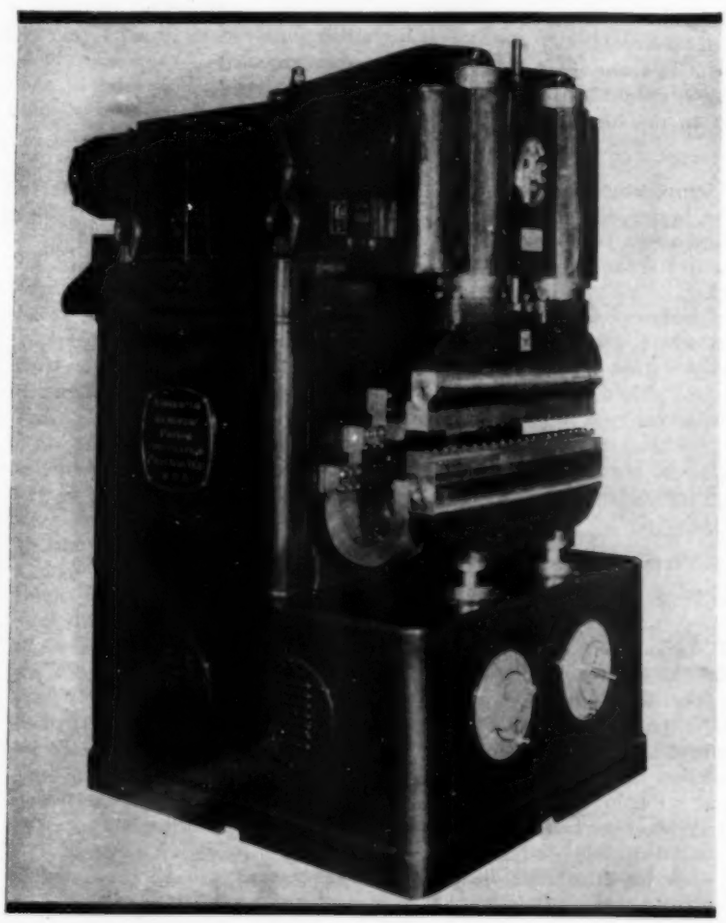
5. *Throat*—The minimum thickness of a weld along a straight line passing through the root.

Under this code the throat of a fillet weld shall be the distance along a line from the root to the hypothenuse at right angles thereto, of the largest isosceles right triangle that can be constructed in the cross-section of the fillet weld; and the throat of a butt weld shall be equal to the thickness of the thinner part joined.

6. *Weld Length*—The length of a weld shall be considered to be the unbroken length of the full cross-section of the weld exclusive of the length of any craters.

7. *Weld Dimensions* — Under this code the dimensions of a weld shall be expressed in terms of its size and length.

The projection welder designed by American Electric Fusion Corporation, demonstrates that arc-welded machines can be good-looking



Welding in Machinery Construction

Section 3—Base Metal

In general, this code refers to carbon steels containing not more than 0.30 per cent carbon. Welding of higher carbon steels and of special alloys should be done with caution.

In many cases, where large tonnages are involved, it may be economical to use specially rolled steel shapes, in which case it is advisable to consult the mills before making the design.

Material shall conform to one of the following classes:

Class 1—Structures made of rolled materials, castings or forgings of known weldable composition for which a test report can be furnished the purchaser. This class of material shall be used in the construction of rotating parts, reciprocating parts and/or structures subjected to severe impact load. No restriction is placed on the chemical analysis of the base metal except as it may affect heat-treatment as hereinafter provided.

Class 2—Structures made of rolled materials, castings or forgings for which no test report is available. This class of material shall not be used in the construction of rotating parts and/or structures subjected to severe impact loads.

Section 4—Filler Metal

All filler metal used for welding for strength or safety of parts constructed under this code shall comply with the current American Welding Society's specifications for filler metal E-10, G-10, E-20, or G-20.

Where alloy base metals are introduced as a part of the structure, the weld metal characteristics should be adapted to the individual requirements.

Section 5—Heat-Treatment

Structures such as rotating parts, reciprocating parts and/or those subjected to severe impact load, in which safety and performance are dependent upon the welds shall be heat-treated for stress-relief or stress-relief and partial grain refinement as hereinafter provided.

Structures whose functions will be affected by the subsequent warpage shall be heat-treated for stress-relief or stress-relief and partial grain refinement as hereinafter provided.

When the material contains not more than 0.30 per cent carbon, the structure shall be heated slowly in a furnace, held for one hour per inch of thickness at 1100-1200 F. and allowed to cool slowly to not more than 250 F. before removal.

When the material has a carbon content over 0.30 the corresponding temperature range shall be 1425-1475 F.

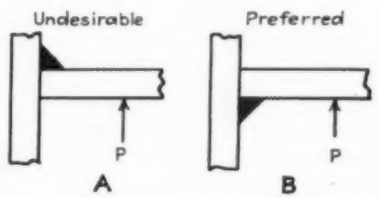


Fig. 1—At *A* the leverage acting at the root of the weld will rip the joint apart. If a one-sided joint is unavoidable it should be placed with respect to the load as at *B*

The higher temperature range is necessary for the higher carbon steels not only to afford stress relief but also to correct excessive grain growth adjacent to the weld.

The heat-treatment after welding of special alloy steels other than straight carbon steels for stress-relief and metallurgical control should be specified by the manufacture or mill.

Nothing in this section is intended to restrict special heat-treatments necessary to bring out definite physical properties.

Section 6—Permissible Unit Stresses

When A. W. S. filler metals E-20 or G-20 are used, the welds may be designed for static loads of 13,000 lb. per sq.in. of throat area in tension or 18,000 lb. per sq.in. in compression and 11,300 lb. per sq.in. in shear, and for dynamic loads of 5,100 lb. per sq.in. in tension or 7,000 lb. in compression and 3,400 lb. in shear.

When A. W. S. filler metals E-10 or G-10 are used the welds may be designed for static loads of 15,800 lb. per sq.in. of throat area in tension or 18,000 lb. per sq.in. compression and 12,400 lb. per sq.in. in shear and for dynamic loads of 7,900 lb. per sq.in. in tension or 9,000 lb. per sq.in. in compression and 5,600 lb. in shear.

The dynamic values in this section are one-fourth of the rotating-beam endurance values for the corresponding weld metal. This factor of four should safeguard the structure against fatigue failure in the presence of a minor defect such as a gas bubble. Welded joints shall be so designed that no severe stress concentration exists at any internal or external boundary. Refer to Fig. 1. This safety factor will not insure the safety of the structure in the presence of elongated defects, grooves or depressions which are loaded at right angles to their greatest dimension.

The requirements of rigidity in a structure may be such that the working stress should be only a fraction of the values specified. Where alloy base metals are introduced as part of the structure, the working stresses should be adapted to the individual requirements.

The maximum fiber stresses due to bending shall not exceed the values prescribed above for tension and compression, respectively.

Filet welds placed either transverse or parallel to the direction of stress shall be considered as under shear.

At points of unavoidable high stress concentration, particular attention should be paid to allowable unit stresses. Refer to Fig. 1.

When the safety of any structure is dependent upon any weld as in the case of flywheel rims, connecting rods or crankshafts of reciprocating engines, such welds shall be fabricated with a grade of weld metal equal to or superior to the base metal. Such welds shall be radiographed to determine their soundness and shall show by such examination no slag inclusions, lack of fusion or porosity in excess of that allowed by the A.S.M.E. Boiler Code for fusion-welded boiler drums. If such welds are not radiographed, the stresses shall be 75 per cent of the values given herein.

This standard will be concluded in the next number.

IDEAS

FROM • PRACTICAL • MEN

Adjustable Indicating Plug Gage

JOHN A. HONEGGER

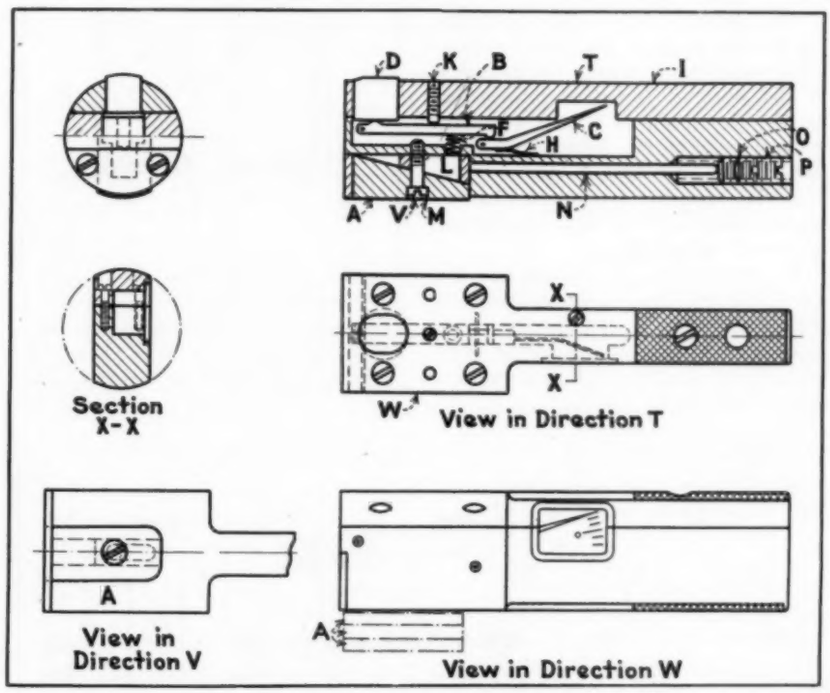
The adjustable indicating plug gage is so designed that one handle or housing can be used for gaging holes having a wide range in diameters. This is accomplished by making gaging shoes *A* of different heights, as indicated by the dotted lines, increasing in increments equal to, or less, the possible adjustments to be obtained. The housing in milled, drilled and counterbored to accommodate the various parts.

Compound levers *B* and *C* are pivoted in sapphire bushings. Lever *B* is kept in contact with gaging block *D* by the spring *F*, and the flat spring *H* returns lever *C* to the minimum position when there is no pressure against gaging block *D*. Cover *I* serves both as a cover for the movable parts and as a guide for gaging block *D*. Screw *K* is for adjusting the indicator after assembly to compensate for machining inaccuracies and for any appreciable wear of the gaging block. Both the cover and the housing are dovetailed to receive the bezel of the glass on which the graduations are etched. The compound levers are so proportioned that each graduation on the glass means 0.001 in. in the diameter of the hole being gaged.

A U-shaped groove is milled lengthwise in the back of the adjustable gaging shoe *A* in which a tongue on the wedge *L* engages. The wedge has a slot to permit locking screw *M* to pass through and to prevent interference as the wedge is adjusted. One end of rod *N* butts against the blunt edge of the wedge, the opposite end being in contact with the adjusting screw *O*.

In adjusting the gage it is set either to a micrometer or to a gage ring. With the locking screw *M* loose and the wedge drawn back, adjusting screw *O* is gradually tightened, pushing against rod *N* and causing the wedge to move gaging shoe *A* outward at a right angle to the axis of the housing. When the indicator is at zero the adjustment is correct. Lockscrew *P* is turned down to lock adjusting screw *O* and screw *M* is tightened. Screws *K*, *M* and *P* are then sealed against tampering by pouring melted sealing wax into their counterbores.

Cover *I* is positioned by blind dowels and is held in place by screws having longer heads than standard fillister heads. After these screws have been screwed home, the heads are filed down to conform to the shape of the housing.



Holes having a wide range of diameters can be gaged by inserting gaging shoes of different heights. The graduations are etched on glass, through which the indicator can be seen

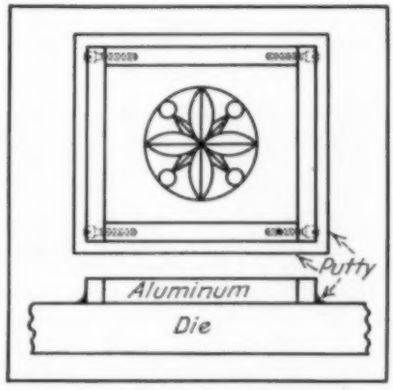
Tools for Embossing Thin Sheet Metal

WILLIAM C. BETZ
Equipment Engineer, Fafnir Bearing Company

In the production of toys, novelties and other articles of sheet metal where the product does not need to have very sharp outlines, a soft punch can be used for embossing.

In making the punch, an aluminum frame is made to fit around the outline of the die impression, as shown in the illustration, and the outer edges next to the die are banked with very stiff putty. The die is heated to about 100 deg. to take off the chill and is lightly brushed with a light high-flash oil. Powderer graphite is liberally sprinkled on the die and the surplus graphite is blown off with a hand bellows.

The material for the soft punch is what is known as No. 4 babbitt and is composed of lead 80.5 per cent, tin 11.5 per cent, antimony 7.5 per cent



For casting the punch, an aluminum frame is placed on the die to serve as a flask and the outer edges next to the die are lnted with putty

and copper 0.5 per cent. This alloy is melted and is kept at about 600 deg. and is poured over the die, the aluminum frame serving as a dam.

Where quantities of the product are small and there is little fancy work and the metal to be embossed is thin, the die may be made of a fine grade of cast iron, preferably containing nickel to make it sharp grained. Where the work is heavier and a sharper outline is desired, or where the quantities are large, the die should be made of steel. The steel may be anything from low-grade carburizing steel to the finest alloy steel, depending upon the hardness and the thickness of the metal to be embossed.

If the die is cast iron it may be either left soft or it can be surface hardened by heating it to from 1,500 to 1,600 F. and liberally sprinkling the face with powder composed of 25 parts of yellow prussiate of potassium and 75 parts of potassium cyanide. The die should be kept at a constant temperature for from fifteen minutes to half an hour and then quenched in a brine-cyanide solution. This imparts a hard scale to the die. If the die is carburizing steel, it should be carburized to a depth of at least 0.030 in. and quenched in water. A die of high-carbon steel or alloy steel should be hardened and drawn according to the specifications of the steel maker.

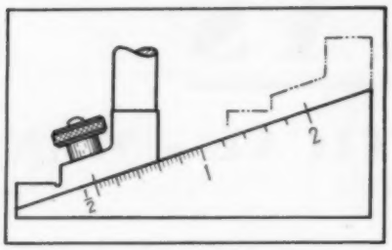
In the case of a cast-iron die or one of carburizing steel, it is best to cast the punch before heat-treating the die to prevent drawing much of the hardness from the surface. A steel die may be heat-treated or not before casting the punch. Metals to be embossed by a soft punch are generally not over 0.020 in. thick, although metal as thick as 0.032 in. has been used with success.

Graduated Planer Gage

EDWARD HELLER

The conventional planer gage can be made much more useful by graduating the base and scribing a zero line on the movable member, as shown in the illustration, enabling the adjustable member to be set to definite heights within fairly close limits.

In most planer gages the incline is at an angle of 18 deg., giving a relation of 1 to 3.23, or nearly 0.01 in. change in height for each $\frac{1}{32}$ in. on the incline. By scribing a series of lines at $\frac{1}{16}$-in. intervals, each space will represent 0.020 in. change in height, and smaller differences can be estimated. A toolmaker having good eyesight, or by using a magnifying glass, can easily "see" 0.005 in. on the height.



In a planer gage having an angle of 18 deg., the movable member will rise 0.020 in., within very close limits, for each 1/16 in. movement on the incline

If the gage is soft, the graduations can be scribed. If it is hardened, the graduations can be etched or made with an electric pencil or a diamond tool.

Jig for Drilling Cross Holes in Round Stock

H. A. GILLILAND
Hamilton, Ontario, Canada

In the jig illustrated, the work rests in a V-block and the distance of the hole to be drilled from the end of the work is controlled by adjustment of the stop screw *A*. The bushing plate is Z-shaped and its vertical part at the back fits in a channel in the jig body. It can be adjusted to bring the bushing close to work of various diameters. After adjustment to suit the diameter of the work, it is locked in position by the thumbscrews *B* and *C*. The vertical part of the bushing plate at the front is held against the plate *D*. This plate and the vertical part of the bushing plate at the back are slotted to permit adjustment.

The base of the jig is flanged at the sides and the flanges are drilled and reamed to provide storage for extra bushings having holes for drill of various diameters. The jig will accommodate round stock from $\frac{1}{4}$ to 1 in.

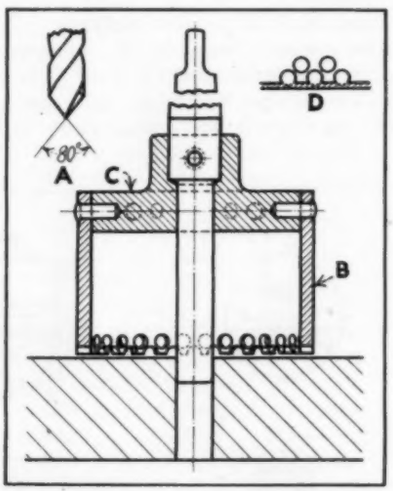
Trepanning Tool for Marble

PHIL E. VERAA

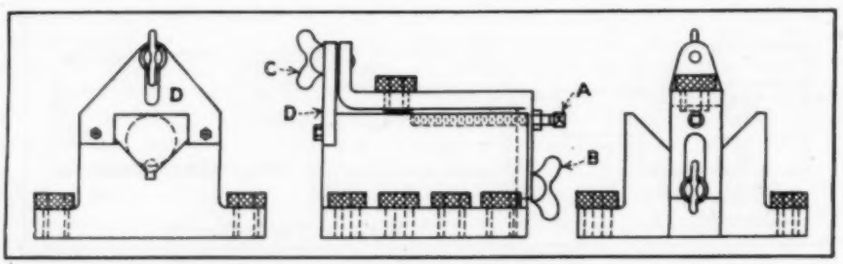
A 6-in. hole can be trepanned in marble 2 in. thick in less than an hour by the tool shown. This includes the time for drilling the pilot hole. For drilling the pilot hole, the drill point is ground to an included angle of 80 deg., as at *A*, and the drill is used without lubricant, its speed being the same as that for drilling soft steel.

The trepanning tool consists of a piece of steel tubing *B* riveted to the flange *C*, which is attached to the combined taper shank and pilot by a taper pin. In the lower end of the tubing two rows of small holes are drilled, the holes being staggered as at *D*. The end of the tubing is then faced off enough to cut well into the lower row of holes, as shown. The tubing is left soft.

In use, coarse sand and water are fed under the lower end of the tool, the coarser the sand the better. Water is added generously while the tool is cutting.



Fed with coarse sand and water, this tool will trepan a 6-in. hole in marble 2 in. thick in less than an hour



The bushing plate can be adjusted to bring the bushing close to the work. Storage for bushings having holes for drills of various sizes is provided in the base flanges

Progressive Press Tools

C. W. HINMAN
Scripto Manufacturing Company

The piece to be produced is shown in Fig. 1, together with the necessary specifications. There are several practicable designs of tools by which the piece can be made in an ordinary press, and several others by which it can be produced in a multi-slide press.

The progressive tools illustrated in Fig. 2 diagrammatically represent one of the means by which the piece can be produced in an ordinary press. The stock is fed from right to left by hand, though an automatic roll feed can be used if the quantity to be produced warrants it.

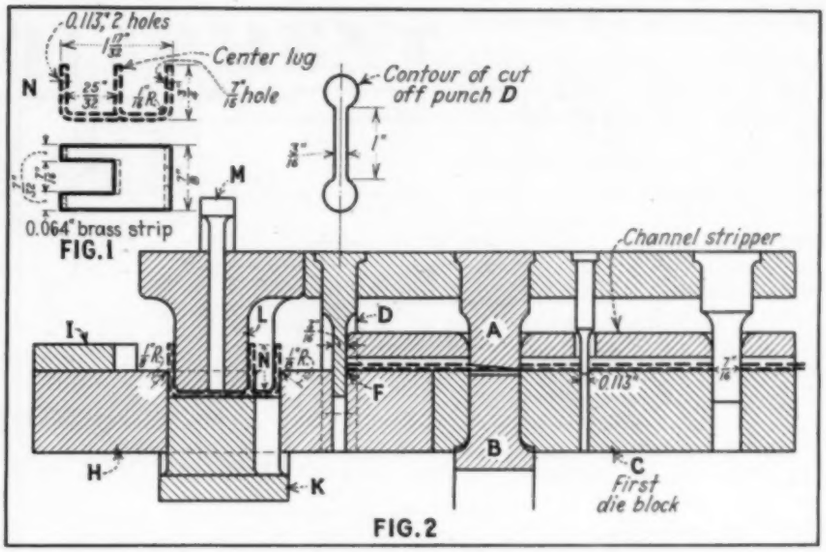
After the three holes have been pierced, the center lug is sheared down between punch *A* and the spring shedder *B* in die-block *C*. The strip is passed along and is severed by cutting out a piece $\frac{7}{16}$ in. long with punch *D* at point *F* in die-block *H*. The strip is then advanced within the width of the gaging slot in block *I* on die-block *H*, and across the face of the spring pad *K*. The blank is cut to length between stop block *I* and punch *D* when the ram descends.

"Creeping" Prevented

Prior to severing the blank, when the ram descends, the face of the bending punch *L* contacts the blank, holding it against the spring pad and preventing it from "creeping." As the ram continues its descent, the free ends of the blank positively contact the $\frac{1}{8}$ in. radii in die-block *H*, with only the thickness of the material between the sides of the punch and the die, the result being that the four angles are bent upward as shown.

At the completion of the down stroke of the ram, the work is "spanked" or straightened up square when the bottom of spring pad *K* registers with the die-shoe. As the ram ascends, the spring pad, with the completed piece, follows the bending punch upward and is stripped by the spring-actuated pin *M*. This leaves the work free to slide off of the inclined press before the ram reaches the top of its stroke.

Another method of producing the piece is by using inverted tools in which the bending punch *L* is attached to the die-shoe and the bending die and the shedder are attached to the punch holder. In this case the severing is done by an adjustable blade attached to the right of the punch. The blade cuts off the blank against the left-hand edge of the first die-block, which is extended to the blade for that purpose.



These progressive tools represent diagrammatically one way of producing the piece in an ordinary press. Another means is by the use of inverted tools, as described

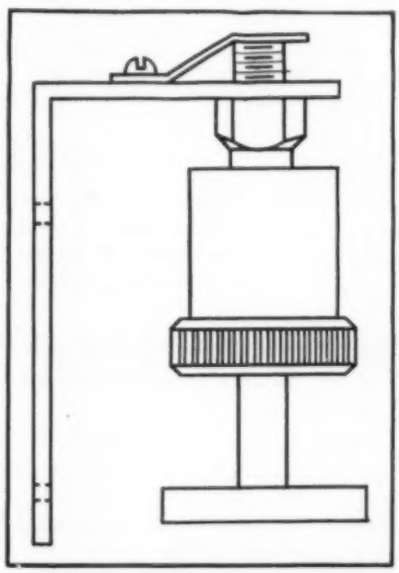
An important feature in tools of the inverted type is that when the part *N* of the work is sufficiently long and is bent downward, as just described, severance of the blank can be done at the right-hand side of the bending punch and against the left-hand side of the first die-block. When the part *N* of the work is bent upward, as in Fig. 1, an independent punch must be used that cuts within the first die-block for severing the blank, and thus a short length of the strip is wasted on each piece.

Prussian Blue Container

C. F. FITZ

In most shops, handling prussian blue for scraping work is quite a messy job. If the blue is kept in a tin box or a can, it soon gets hard and useless. If it is in a collapsible tube, the tube is likely to be cracked from constant squeezing and the blue oozes out of the cracks and smears the workman's fingers.

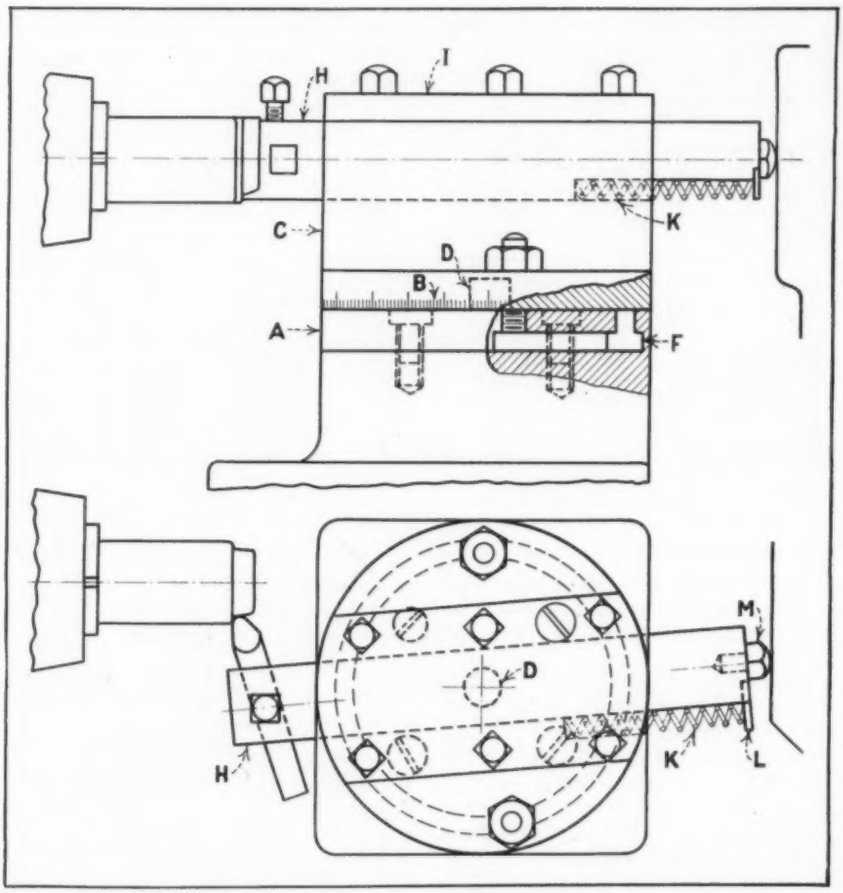
A convenient container and dispenser of prussian blue is shown in the illustration. It consists of an ordinary compression grease cup screwed into a tapped hole from the under side of a bracket and a piece of spring steel pivoted by a screw to the top of the bracket, the free end covering the nozzle of the grease cup.



This container for prussian blue protects the contents and eliminates waste

In use, the grease cup having been filled in the usual manner, the spring is pushed to one side and the cover of the graese cup is turned to discharge just enough prussian blue for immediate use. It can be wiped off with the same swab of waste that is used to spread it on the work. The spring is then swung back over the nozzle of the grease cup to prevent the blue from getting hard and to keep out dust and dirt.

The bracket can be attached to the bench, the wall back of the bench or even to the workman's toolchest.



The toolbar slides in a swiveling base attached to the front toolblock. A compression spring returns the toolbar to the starting position when the turret is withdrawn

Taper Attachment for the Turret Lathe—Discussion

R. G. HEWITT
Huddersfield, Yorkshire, England

In an article under the title given above (*AM*—Vol. 79, page 214), Douglas Turner describes an ingenious taper attachment for the turret lathe, which I think has a serious defect. The overhang of the attachment from the toolblock will cause chatter, and any flaws or hard spots in the work will either cause the tool to dig in or be pushed away, as the case may be.

In the attachment ilustrated herewith, this defect has been eliminated, and a device that is compact and sturdy has been aimed at.

The base *A* is attached to the front toolblock and is graduated at *B*. The swiveling body *C* is centrally located on the base by the pin *D* and is secured at the desired angle by bolts engaging a circular T-groove in the base, as shown in section at *F*. The toolbar *H* is a good sliding fit in the body and is confined in place by the top plate *I*. A hole in the body receives one end of the compression spring *K*, the opposite end being located on a pin in the plate *L* at the rear end of the toolbar.

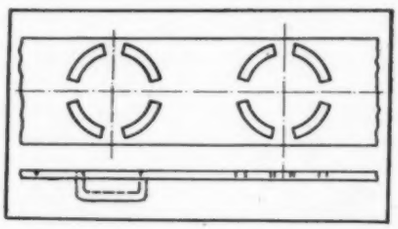
In operation, when the turret is advanced, a plug in one of the holes contacts with the head of the hardened screw *M* in the rear end of the toolbar. Continued forward movement of the turret pushes the toolbar so that the toolbit contacts with the work and travels along it, at the same time compressing the spring. When the turret is withdrawn, the toolbar is returned to the starting position by the spring.

Locating Stations in Progressive Tools

CHARLES WESLOW

In making progressive press tools, a fact often overlooked by diemakers is that operations performed at each of the stations will cause the stock either to expand or contract, depending upon the nature of the operations.

Diemakers often take it for granted that the stock will slide merrily along from station to station with the part comprising the item to be made. But after the tools have been completed it is found that the item, as it went through the first operation, does not match up with the tools for the second operation and is far from matching up with the tools for the final operation. The consequence is that the tools for all operations after the first must be relocated.



Piercing the circular slots will cause the stock to expand slightly, and drawing the shallow cup will cause it to contract

Suppose a round item is to be made from brass 0.030 in. thick and 1 in. wide, and that some of the material around the item to be made is pierced away at the first station, and that a shallow cup is to be drawn at the second station, as shown in the illustration. The strip will expand from pressure of the piercing tools, and the item the perforations are for will not match up with the tools at the second station, making an unevenly drawn cup.

Since the drawing operation causes the strip to contract, the distance between the centers of the item in two stages in the strip will not be the same as the center distance between the tools that are already in place. At the third station, something may be done that will further expand or contract the strip, and so on to the final station. If dummy pilot holes have been pierced at one station, then at the next station either the pilots will be broken or the holes will be distorted, causing further trouble.

In making gang tools, I first make simple test tools for each operation, either of cold-rolled steel or cast iron, and then find out what each operation does to the stock. Using a strip of certain length as measured with a vernier caliper to within 0.005 in., I measure the strip after each operation, I can then determine the distance between the tools for each operation. In making progressive tools, whenever possible I make them in sections and do not dowel them in place on the die-shoe until I have found out just what each operation does to the stock. In that way I play safe.

SHOP EQUIPMENT NEWS

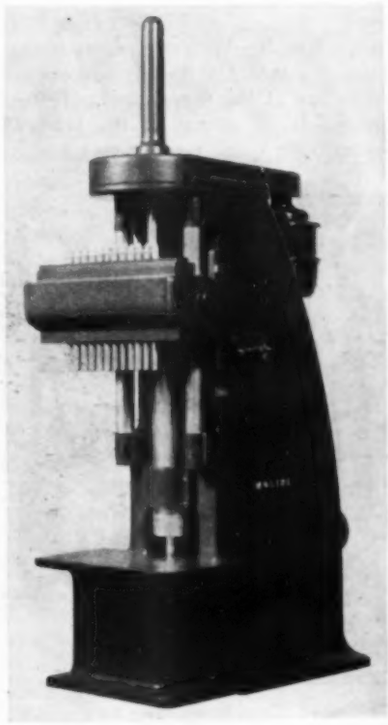
Moline Hydraulic Feed Drilling and Boring Machine

The continuous spiral drive has been retained on the cylindrical-guide, hydraulic-feed drilling and boring machine recently announced by the Moline Tool Co., Moline, Ill. In the past this main spiral has been held to 3½ in. diameter on all machines, whereas on this design, the spiral is made much larger and is hollow, being supported internally on ball bearings. The advantage of the larger diameter spiral is better tooth contact between the driving and the driven gears. This main spiral is driven by a helical gear meshing directly into its teeth through a train of spiral and spur gears and V-belts to the motor. A vertically mounted motor on the back of the machine is connected through V-belts to the spline shaft in the center of the machine.

The fit of the spindle units or heads on the rail is changed from the square fit, so long used, to beveled clamping surfaces, so that when the lower clamp is tightened, the heads are drawn squarely on the rail. These heads are fitted together with filler blocks and grease guards, making the entire unit oil-tight. The gears are lubricated through a circulating oil system.

In place of the double V guides, this machine is provided with cylindrical hardened ways, there being two hardened steel shafts accurately mounted on the front of the column. The supports of these shafts are smaller than the bearing surface to permit grinding the bearing surface down without disturbing the fit in the column.

The hydraulic cylinder is accurately finished both inside and out, and has a flange connection to the lower side of the rail with the stuffing box and piston rod at the lower end. The outside of the cylinder fits in a bushing rigidly supported in the column at the farthest possible distance below the rail. This guide bearing, with the two



on the hardened shafts, makes a rigid, three-cornered support, and also provides a construction which, when worn, can be restored to its original alignment by inserting new bushings and grinding the guides if necessary. A hollow stationary piston rod is used, and the hydraulic connections are made to the lower end. A separate motor drives the hydraulic pump for the feed of this machine. A weight, within the column, suspended on cables running over ball-bearing supported sheaves, counterweights the sliding rail carrying the spindle unit. The spindles can be adjusted out to a maximum center distance of 36 in. Approximate weight of the machine is 12,000 lb.

Landis Revolving Diehead

The revolving diehead placed on the market by the Landis Machine Co., Waynesboro, Pa., is an adaptation of the ¾-in. "Lanco" head, but has a standard capacity up to 1¼ in. American taper pipe thread with a maximum thread length of 1¼ in. By using special oversized chaser holders, diameters up to 2¾ in. can be cut with a maximum thread length of 1⅛ in. Any degree of taper can be provided up to 2 in. taper per ft. by using the proper operating ring and cam shoe.

The taper cutting action is obtained through a cam which is integral with the operating ring. Attached to the closing ring of the diehead is a cam shoe which is machined to correspond to the operating cam. As the threading spindle moves forward, the closing yoke on the diehead contacts the adjustable stop nut on the stop bar on the machine, just as the chasers begin to form the thread. At this point the forward travel of the operating ring is retarded while the diehead itself continues to move forward to produce the thread. This construction causes the chasers to open gradually, thus generating a tapered thread. When the cam shoe has traveled the full length of the cam or the operating ring, the diehead automatically opens. Adjustment for thread length is obtained by setting the stop nut on the stop bar. Since the forming and finishing of the thread is done by the first few teeth on the chasers, cutting strains are no greater than would be required for cutting a straight thread of corresponding diameter.

The length of the thread is not limited by the width of the chasers but by the cam travel

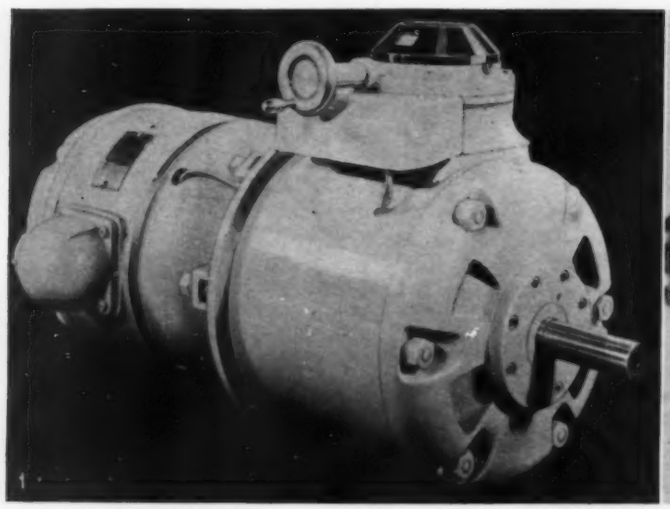
New Departure Variable Speed "Transitorq"

Speed changing devices in which the ratio is varied by any desired increment have received much attention by inventors and designers with varying degrees of success. Profiting by past experience, the New Departure Manufacturing Company of Bristol, Conn., presents the variable speed power unit shown in the following illustrations, the units being built with any type of motor desired. Fig. 1 is the complete unit with the output shaft projecting from the end.

Speed changes are obtained by varying the position of three hardened steel rollers in pressure contact with hard steel races, those for one unit being shown in Fig. 2, and a partially assembled unit in Fig. 3. The power transmission is comparable to locomotive driving wheels acting on the rails. There is, however, a vital difference in that this power unit has an automatic pressure device that keeps the pressure of the rollers on the races proportional to the torque load, utilizing the torque load itself to generate the desired pressure. The device is so sensitive that this pressure is maintained whether the load is continuous, variable or shock, which insures positive driving under all conditions, even with extreme overload.

A study of the sectional view, Fig. 4, shows the operation of the device with the rollers between the input, or driving race *A*, and the output, or driven race *B*. With the rollers in the position shown, the driving and driven shafts run at the same speed. Tilting the rollers by means of the yoke *C* changes the speed ratio, giving higher or lower speeds depending on the direction of movement as indicated. Ratios vary from 6 to 1 to 10 to 1, depending on the size of the unit, giving speeds of from 600 to 3,600, or from 560 to 5,600 r.p.m. with a standard 1,750 r.p.m. motor. Between these limits the speed can be varied to the exact number of revolutions required. Motors of 1,200 or 900 r.p.m. can also be supplied where lower speeds are desired.

The hand wheel which controls the speed changes through the movement of *C* in Fig. 4 rotates an indicator dial by means of a worm and worm wheel. This can also be operated by remote control. Within the circular housing is a vane connected to the vertical shaft that operates the roller shifting mechanism. On starting the unit, oil pressure from the power unit pump moves the vane until it reaches a stop in the housing that has been set by the indicator. This pressure keeps the vane in contact with the stop so that the hand wheel rotates both parts as



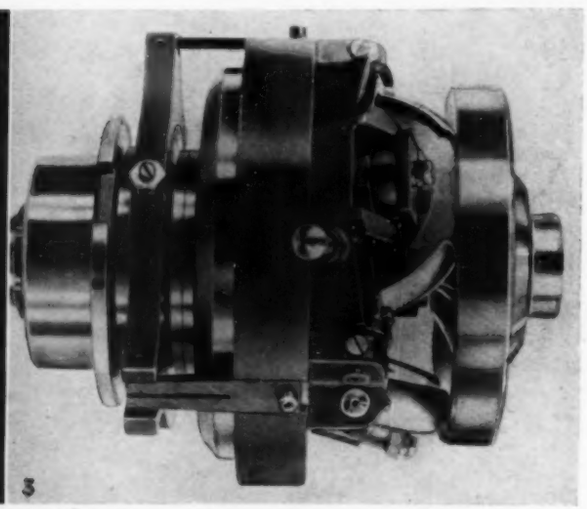


Fig. 1—The New Departure Variable Speed Transitorq may be built with any make of motor. Fig. 3—A partially assembled unit showing the spider construction carrying the rollers in contact with the races

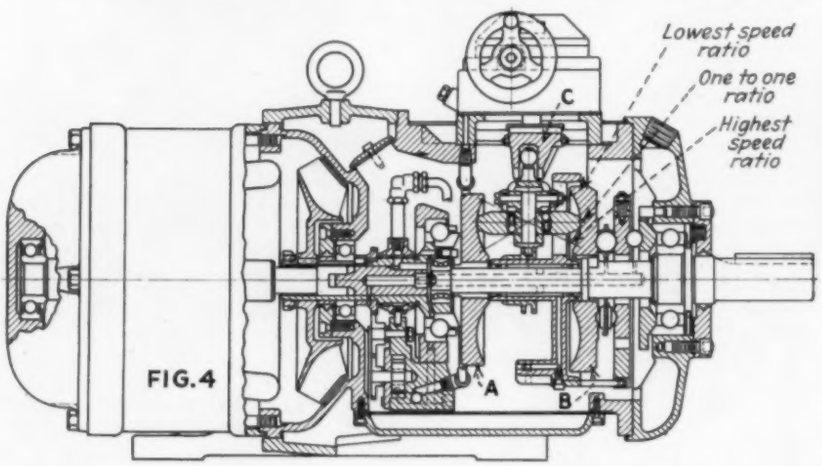


FIG. 4

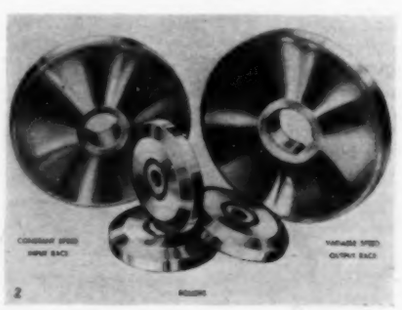


Fig. 2—Output speed is infinitely adjustable over the unit's range by varying the roller position relative to the races. Fig. 4—Section showing the roller position giving the high, low and one to one ratios

Fig. 5—Rotary movement of the floating flange causes axial movement which is communicated as thrust to the output race

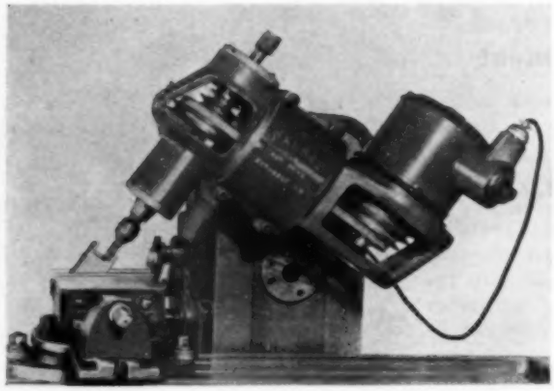
one, varying the speed as desired. Stopping the power unit relieves the oil pressure and the vane shifts back under spring pressure to low speed starting position. This permits adjustment for any speed, either before or after starting; automatic return to low speed, high torque starting position whenever power is switched off; automatic shift from low to any preselected speed.

Automatic control of roller contact pressure is secured by the three balls and the cam plates in Fig. 5. The round plate is stationary while the other floats with the torque, motion being imparted by the three steel fingers by which the pressure of the races against the rollers increases with the load imposed on the power unit.

It is this feature which prevents slip regardless of the load. There are no adjustments nor is lubrication required beyond adding to the supply in the reservoir. Many applications have been made, including grinding machines, lathes and drill presses in the machine tool line, the device frequently being built into the machine itself.

Ross Two-Pressure Valves

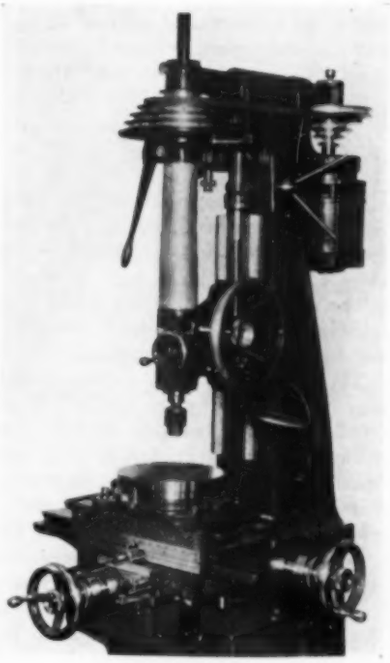
The actual pressure required for the idling stroke of a piston in a cylinder is in most cases less than that required for the work stroke. The Ross Operating Valve Co., 6482 Epworth Blvd., Detroit, Mich., is producing a two-pressure operating valve which provides for full line pressure on the work stroke, and selected reduced pressure for the idling stroke. The selected reduced pressure is set or adjusted after the valve is installed. This difference in pressure results in an appreciable saving in air consumption. The company's two-pressure operating valve is identical with its standard four-way valves, with the addition of a built-in reducing valve which can be regulated from zero to full line pressure for the idling stroke.



The attachment is built to fit a 4¼ in. milling machine overarm, but adapters for smaller diameters and for horizontal boring mills are available

Dalrae Speedmill Attachment

Dalrae Tools Co., Syracuse Bldg., Syracuse, N. Y., has placed on the market a high-speed milling attachment for use on milling machines and horizontal boring mills. This attachment, when mounted on the overarm of a machine, swivels in four directions and mills at any angle. It eliminates the necessity for using large motors for cuts made with small end-mills. Manufactured in one size only, the attachment may be equipped with either a ¼- or ½-hp. motor. The ¼-hp. attachment produces speeds of 500, 1,200, 2,500 and 4,000 r.p.m. and has a capacity to mill with cutters from $\frac{1}{16}$ to $\frac{5}{8}$ in. diameter in steel; the ½-hp. attachment produces speeds of 350, 650, 1,700, and 3,000 r.p.m. and has a capacity to mill with cutters from ⅛ to ⅞ in. diameter in steel. Aluminum alloy castings are used throughout; the ¼-hp. attachment weighs 66 lb., and the ½-hp. attachment, 86 lb. The spindle housing, main swivel and motor mounting are all contained in one casting, decreasing the possibility of chatter. Four steel gripping pads and a yoke that is not split insure rigid mounting. Squaring surfaces and a graduated scale are provided for ease and speed in setting the attachment at the desired angle.



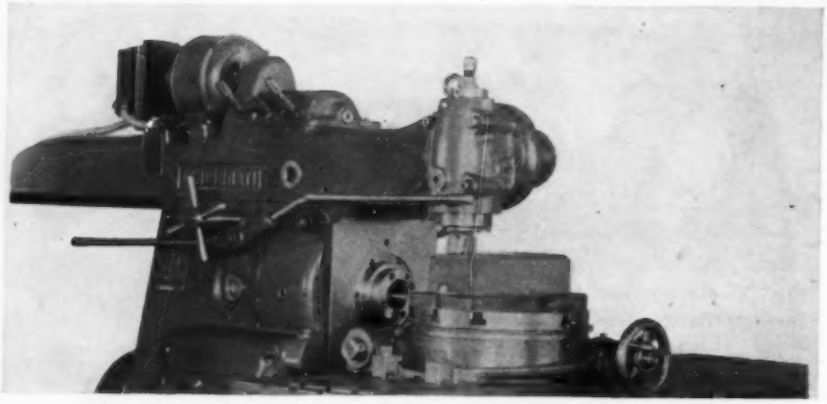
Moore Jig Borer

The Moore Special Tool Co. Inc., 52 Remer St., Bridgeport, Conn., announces some changes and improvements which have been incorporated in its jig boring machine. Increase in the size of the column and slides provides greater rigidity and accommodation for larger bearings. Power feed has been added to the spindle. A large aluminum handwheel facilitates quick travel when drilling. All electrical equipment is built into the machine. Larger dials and vernier permit direct reading of adjustments to 0.0001 in. Five spindle speeds ranging from 190 to 2,000 r.p.m. are available. Maximum boring capacity in tool steel is 1½ in., in mild steel, 2 in. Specifications: Table working surface, 10x16 in.; table travel, longitudinal, 14½ in.; table travel, crosswise, 9⅛ in., table top to spindle end, maximum, 15 in.; weight, including motor, 1,450 lb.

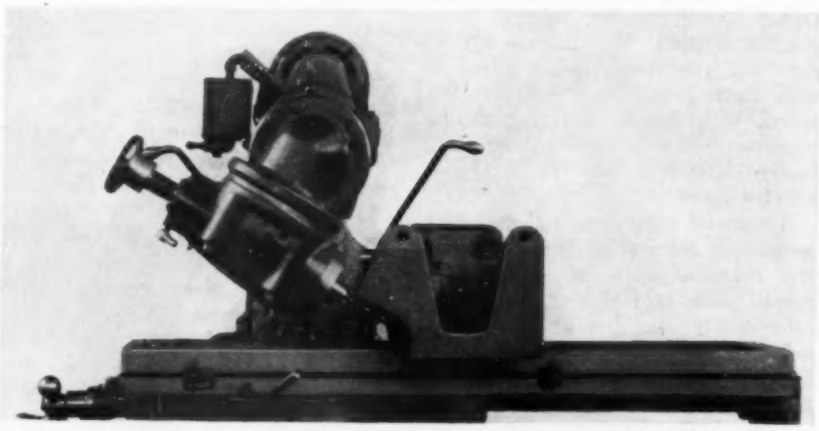
Cincinnati Universal Milling Attachment

The motor driven universal milling attachment announced by the Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, is a self-contained unit, built into the machine overarm, and replacing the standard overarm supplied with the machine. It does not interfere with the normal use of the overarm and arbor support, as the spindle carrier can be swiveled out of the way. A constant-speed, 1-hp. motor is mounted on top of the overarm and connected to the speed box by means of a flexible coupling. Nine speed changes, ranging from 100 to 1,030 r.p.m. are obtained through sliding gears. Automatic lubrication and a visible oil gage are provided in the speed-change unit. Cutters are interchangeable between the attachment spindle nose and the spindle of the modern Cincinnati miller. Anti-friction bearings are provided for the attachment spindle, and the shafts in the swiveling unit. One direction of spindle rotation is standard, but a reversing switch can be supplied.

The flexibility of the attachment may be increased by the addition of an auxiliary hand-speed quill device. This device is convenient for drilling and boring holes at an angle, not exceeding 3 in. in depth. It consists of a sleeve which fits into the straight hole in the attachment spindle. This sleeve is supported at the cutter end by a bushing which fits into the taper hole of the spindle and is prevented from rotating by the key between the bush and the sleeve.



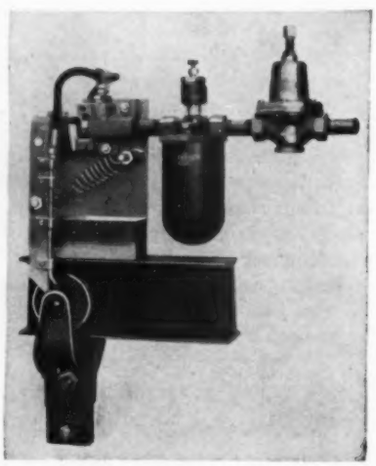
Fewer set-ups, because cuts can be combined, are obtained with the Cincinnati motor driven universal milling attachment

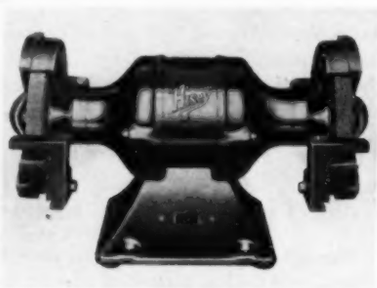


A draw-in bolt keeps the taper shank tool securely in the No. 7 B&S taper hole in the sleeve of the quill device

Fauver Conveyor Trolley Lubricator

The J. N. Fauver Co., Detroit, Mich., is marketing a pneumatic trolley lubricator for conveyors, particularly those that pass through enamel ovens, which tend to cake the lubricant, or through washing machines where the lubricant is broken down and washed out. Poorly lubricated trolley wheels freeze, and the increased drag results in chain breakage. In the lubricator, plant air pressure is reduced by a standard Norgren reducing valve to operating pressure. The air then passes through a Norgren air line lubricator which introduces into the air stream lubricating oil of the proper viscosity a drop at a time. Thus, a fog of oil is applied under pressure to the trolley bearings. The bearing lubricator consists of a unit built of cold rolled steel, attached by four machine screws to the top of the conveyor rail. As each trolley passes under the lubricator, it trips a pair of triggers which automatically releases jets of fogged oil into the bearings. Oil storage capacity is 1½ pints. Air pressure, oil volume and direction of the jet are readily adjustable.



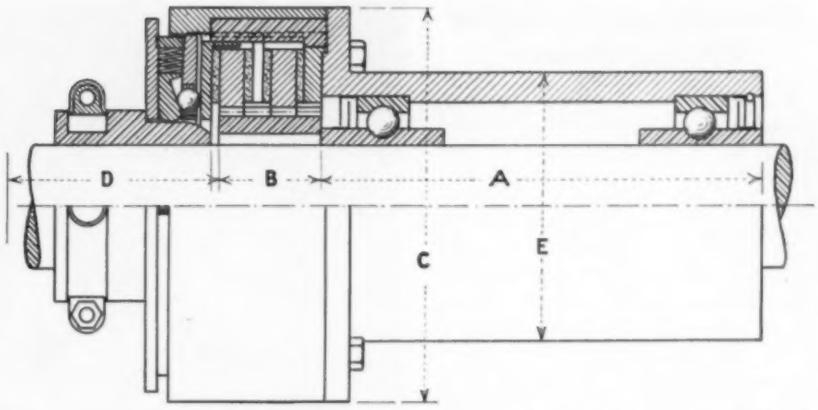


Hisey-Wolf Bench Grinder

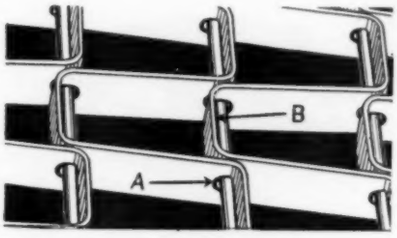
The Hisey-Wolf Machine Co., Marshall & Colerain Sts., Cincinnati, Ohio, announces a ½-hp. double-end, motor-driven bench grinder. It is suitable for many light tool and miscellaneous grinding jobs. Wheels 7x¾ in. are used. The grinder is equipped with sealed ball-bearings. Models are available for 115 and 230 volts d.c. On a.c. circuits the motors may be split-phase type or squirrel cage, the latter being used on 220 and 440 volts, three phase. The control switch is conveniently located in the front of the base.

Kinney Disk Clutch

A fully inclosed, single-point-adjusting, disk clutch is being placed on the market by the Kinney Mfg. Co., 3541 Washington St., Boston, Mass. It is suitable for use either as an integral part of a machine or for general transmission of power. Three sizes, single or double disk, with capacities ranging from 1 to 6 hp. per 100 r.p.m. are available. It is made either as a sleeve clutch with several types of sleeve bearings, or as a cut-off coupling. High speed is obtainable with transmitting capacity in direct ratio to speed. The friction disks are faced with burn-proof asbestos which permits extreme slippage in starting a load so that an easy pick-up is possible. All working parts of the shifting mechanism are hardened steel assembled within the case front and require very short movement of the shifter cone to engage or release the disks.



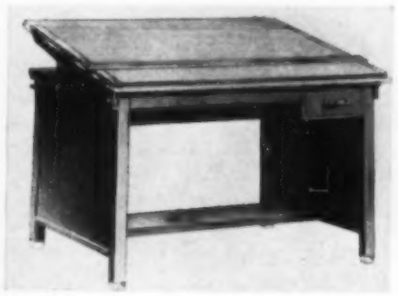
Short movement of the shifter cone will engage or release the Kinney Disk Clutch



Acme Steel-Mesh Conveyor Belt

The improved conveyor belt, announced by the Acme Steel Co., Chicago, Ill., is especially adapted for conveying products to drying ovens and for sorting and assembling departments. The open mesh allows free circulation of air, heat, water and steam, making it applicable for products that must be washed, cooled or dried. Acme belts are composed of formed strips of flat steel connected by pivot rods. Formerly, these rods were strung through round holes; the edge of the hole was the only bearing for the rod. To reduce wear on these rods, the holes *A* are now elongated to a point where the entire flat surface *B* of the U-shaped section is utilized as a bearing. This change has materially increased the serviceable life of the belt, and has also increased the flexibility and smoothness of operation. These belts are manufactured of cold-rolled strip steel, electro-galvanized to resist rust, or of stainless steel.

Table with counterbalanced top



Engineering desk with reversible drawing board

Hamilton Improved Table and Engineering Desk

Improvement and simplification of the Auto-Shift drawing and reference table has been announced by the Hamilton Manufacturing Co., Two Rivers, Wis. The series includes a full-floating, counterbalanced, adjustable drawing board top. In adjusting the board for height, a slight pressure on a foot lever releases the clamp holding the table top in position. When the foot lever is released the top is locked securely in place. The slant of the board may also be controlled, a rod underneath the front being depressed and the top released to be tilted to any slant desired. When level, the drawing board has a height adjustment of from 33¾ to 46¾ in. The rear surface, or top of the base, forms a desk or reference table for the draftsman in front of the one using the table.

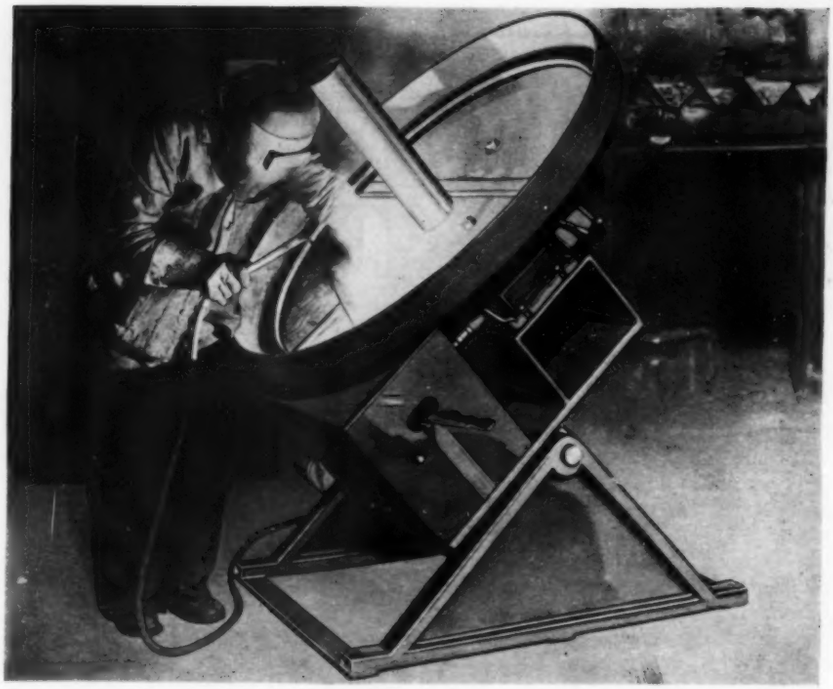
The company has also introduced an engineering desk with a reversible drawing board top, which may be tilted to various angles. When reversed, the top may project over the back of the table any required distance. This is possible because the top is mounted on a sliding channel along the ends.

"Standard" Truck Caster

The yoke of the caster, made by the Standard Truck Caster Co., Manistee, Mich., but sold by the Metzgar Co., Grand Rapids, Mich., is forged as a single unit. The axles are machined from cold-rolled steel, ⅝-in. in diameter, with a shoulder at one end to give rigidity to the yoke and to prevent the axle from turning. Ball races are closely machined to the contour of the ball, and penetration into the raceways is minimized. Increased wheel clearance is made possible by the compactness of the swivel design. A machined baffle between the top plate and the yoke prevents dirt and grit from entering the ball races. Forged-steel and Metzgar floor-protective "End-Wood" wheels are available. Diameters range from 2½ to 20-in.

Harnischfeger Turntable Welding Fixture

A welding fixture with an inclined turntable for easier handling of circular pieces has been announced by the Harnischfeger Corp., Milwaukee, Wis. To enable the operator to weld continuously in a downward position, the turntable is equipped with an electrical rotating mechanism with gear shift and variable-speed motor control. Speed can be accurately regulated from 3 to 18 in. per min. in either direction at the circumference of the 42 in. table. Thus, in welding a circular piece, the operator may hold the rod in a steady position as the work passes beneath it at the desired speed. The turntable can be tilted from one side of the base to the other or held in a horizontal position. Recently, fabricating time on a large gear was reduced from 32 to 13 hours when 65, 3/8 in. rods were deposited in 2 hr. Although primarily designed for handling circular shapes, it also handles other unwieldy pieces. Known as the "RT," this fixture is offered in various sizes to handle loads up to 4 tons.

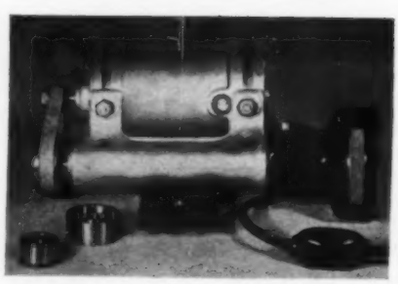


Milburn Gas and Air Purifier

The Alexander Milburn Co., 1416-1428 West Baltimore St., Baltimore, Md., has developed a gas and air purifier having a glass shell through which any accumulated oil, moisture or dirt can be seen. A series of perforated plates and strainers removes foreign substances from the air or gas lines, to insure a moisture-free flow for paint spraying, welding or similar operations. The device is equipped with a 3-in. diaphragm regulator having a graduated gage.

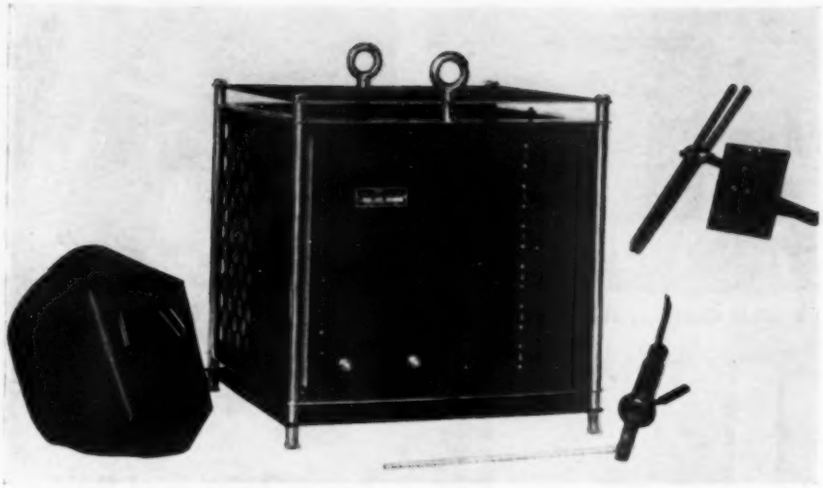
"Thermac" Grinder

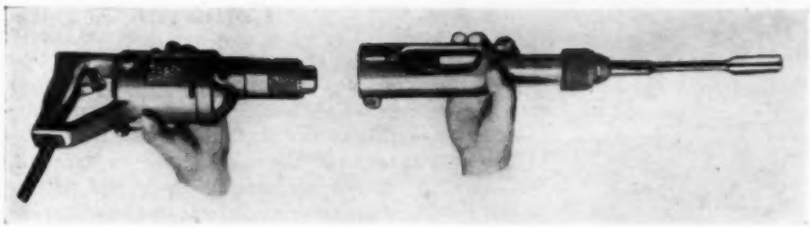
The "Thermac" grinder manufactured by the McGonegal Manufacturing Co., Rutherford, N. J., is particularly adapted for grinding jobs that are hard to get at. The circumferentially adjustable grinding spindle can be locked in any desired position, enabling the operator to set the spindle center to the lathe center, in front of the motor for internal or external grinding, or to the rear of the motor for large diameter external grinding. For longitudinal external grinding between centers, the extension arm can be used, making it possible to grind pieces as large in diameter as the full swing of the lathe. The grinder attaches directly to the compound T-slot of any lathe. Through the adjustment of the compound rest, or by swinging the grinder, any angle can be obtained. A 3-in. wheel is the largest used on the grinder. A 1/3-hp. universal motor is fitted. Four pulleys provide spindle speeds from 7,000 to 36,000 r.p.m. The machine weighs 10 lb.



Simplex Carbide Grinding and Lapping Machine

The Simplex carbide grinding and lapping machine introduced by the Stokerunit Corp., 5325 W. Rogers St., Milwaukee, Wis., is designed for grinding and lapping various types of carbide tools. Two tables are provided for the tools, each having means for shifting the table in relation to the face of the wheel and for accurate angular settings. A protractor, which is interchangeable between the two tables, is also furnished, making it possible to grind and lap tools with the same set-

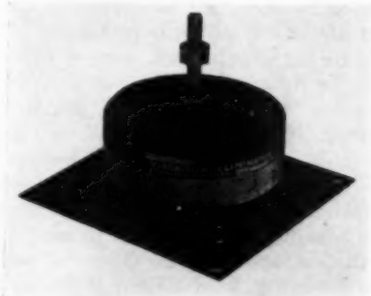




ting. The lapping disk is of cast iron, charged with diamond dust and oil. This machine can also be provided with a pump, oil pan and supply tank, having hooded wheels to prevent splash from being thrown around the machine.

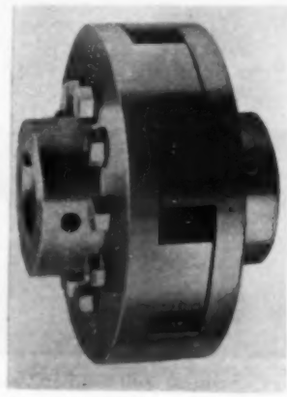
Vibration Eliminator

A vibration eliminator, or shock absorber for machinery, has been introduced by the Vibration Eliminator Co., 41-26 37th St., Long Island City, N. Y. It consists of a base stamping and supporting housing to which the leg or base of the machine may be rigidly fastened. Eliminators may be supplied for any load between 175 and 375 lb. each. The isolating material, natural cork, is not affected by water, oil or temperature changes. It does not take a permanent set under excessive loads.



"Do-All" Hammer and Twist Drill

In the "Do-All" combination electric hammer and drill, announced by the Wodack Electric Tool Corp., 4627 West Huron St., Chicago, Ill., the hammer mechanism is so constructed that there are only two working parts. By opening the chuck and loosening a capscrew, the hammer member may be removed and the tool used as an electric drill with a capacity of $\frac{3}{8}$ in. in metal. It may also be used as a portable grinder and buffer. When used as a hammer with star drills the tool drills holes in concrete and masonry up to $1\frac{3}{8}$ in. diameter, and by using special tools it does chipping, chiseling, cutting and vibrating.



Roffy Automatic Arc Torch and Welder

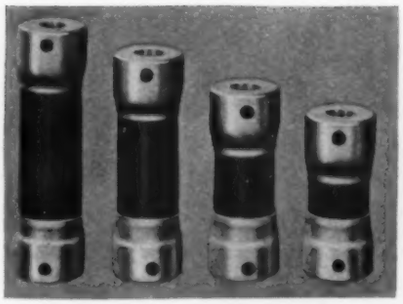
The Electric Torch Manufacturing Co., 5321 Horton St., Oakland, Cal., announces the addition of two sizes of arc torch and welder, known as the No. 3 and No. 4, to its line of cutting and welding equipment. Six graduated steps of heat control, a self-adjusting voltage regulator and automatic starter for the arc are provided. Light gage materials, 26 to 28 gage, up to most any size and weight may be handled by the No. 3 machine. The No. 4 machine encompasses the heaviest work encountered in commercial welding. The case contains a bank of nichrome ballast resistances that provide self-adjusting voltage and heat variations through their respective switches, an electro-static impedence and an automatic arc starting relay. This starting relay causes an ionization of space between the welding electrodes and the work, or in the case of the torch between two carbon electrodes, and thus starts and maintains a steady flow of current. The No. 3 size uses $\frac{1}{8}$ to $\frac{5}{16}$-in. coated or uncoated electrodes and will operate on 220 volts, 60 cycles, single phase or any two leads on a three-phase circuit. Rating is 10 kw., net weight 200 lb. The size No. 4 contains the same equipment; the weight of the machine is 280 lb., and it operates on 220 volts, and draws 125 amp.

L-R Type "P" Flexible Couplings

The L-R Type "P" flexible coupling, manufactured by Lovejoy Tool Works, 4956 West Lake St., Chicago, Ill., has individual free floating load cushions hung between the jaws on removable studs. This cushioning material is either Metalflex, leather or Multiflex. Metalflex is a brake-lining material used for heavy shock loads, as on excavating machinery, steel mill equipment, and where exposed to extreme weather. Multiflex is a rubber-duck fabric, vulcanized under pressure, for use on fluctuating loads and where high resilience is required. These load cushions are visible for inspection and can be replaced. There is no wear on the iron or steel jaws, and no lubrication is required. One-half of the cushions are idlers, except on reversing loads, hence there is always a set of new cushions in the coupling. Thus, load cushions can be interchanged without tearing down the coupling. Couplings are available in shaft diameters from 3 to 10 in.

Guardian Flexible Coupling

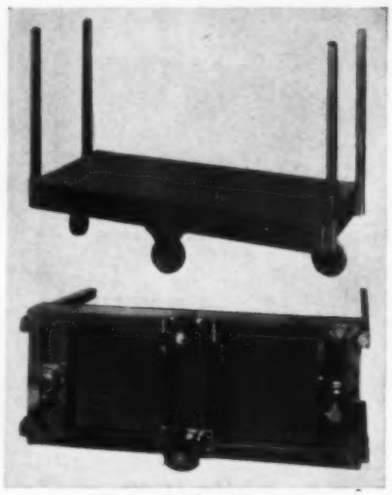
This coupling for fractional-horsepower motors, designed to eliminate noise and transmission of motor torque vibration from the motor to the driveshaft, is being introduced by the Guardian Utilities Co., 1023 East 46th St., Chicago, Ill. It is made of flexible rubber, treated to resist action of oils, and is offered in various lengths to eliminate the extra cost of shaft extensions. The device will operate under reasonable lateral or angular misalignment without binding. It is suitable for use with cushioned or spring motors, either base or flange mounted. It is available in lengths from 2½ in. up, and with any combination of bores, $\frac{5}{16}$, ⅜, $\frac{7}{16}$ and ½ in.



Typical Guardian flexible couplings

Stackbin All-Steel Platform Truck

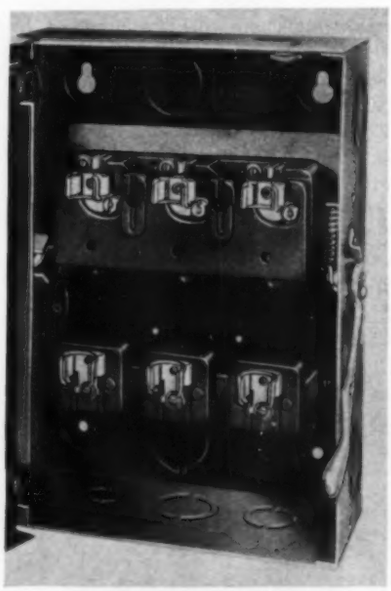
These all-steel platform trucks manufactured by the Stackbin Corporation, Providence, R. I., are designed for general factory use. They are constructed of one piece of heavy-gage sheet steel, formed into an inverted box section, with undersides also formed inward and reinforced with 4-in. formed channel struts. The unit is electrically welded. The casters are of the pressed-steel type, welded to the under side. Standard stakes are of 2x1½x⅛ in. channel, 27 in. long. Finish is battleship gray enamel, baked on.

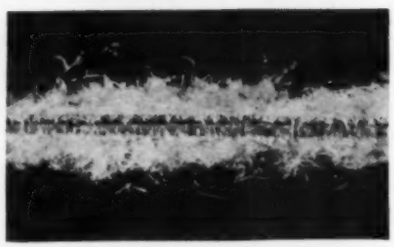


Electrically welded steel truck

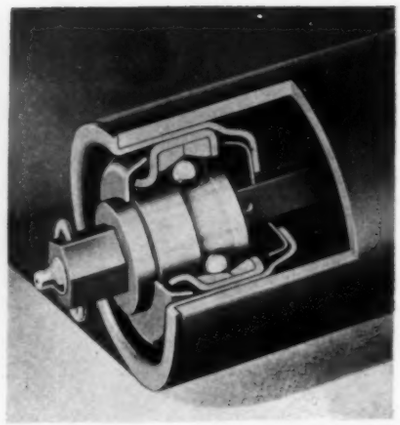
Felters Felt-Bonded Metal

Felt-bonded metal, offered jointly by H. H. Roberts & Co., Pittsburgh, Pa., and the Felters Co., Boston, Mass., is manufactured by a method which produces a permanent bond between felt and metal. The material has advantages for sound deadening, vibration absorption, heat and cold insulation. In the process a metal coating is fused between a layer of felt and the metal, so that the fibers of felt are imbedded in the metal coating, and there is a complete bond which will not separate under heat, cold, moisture, fumes, or mechanical friction, strain or distortion. Felt may be applied to one or both sides of the metal. The thickness of the felt and the weight of the sheet metal may be varied to suit requirements. After the felt is applied, the metal can be bent or shaped without breaking the felt contact.





Section through felt-bonded metal



Logan Improved Roller Conveyor

The Logan Co., Louisville, Ky., has developed an improved roller conveyor in which hexagon shafts prevent rotation of the shaft in the frame and rotation of the bearing race on the shaft. A retainer ring in each end of the shaft prevents lateral movement. The shaft may quickly be removed from either side of the frame. Sealed bearings are set back from the end of the roll in a protected position, except on light duty and special construction. The outer shield, which is fixed to the stationary inner race of the bearing, does not touch any rotating part. Bearings are pressure lubricated and may be regreased through the shaft by means of a gun.

Colt-Noark Type C Safety Switches

Production on a line of "Colt-Noark" Type C safety switches is under way at the Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn. Models incorporate the Dual-break switching principle, patterned after the "Quadbreak" design. A sliding switching member causes each leg of the circuit to be broken at two points instead of one. The arc is thus greatly reduced, the safety of the switch in operation is increased, and the life of the switch is prolonged. A feature is the unit block, each of which may be removed wholly or in part, for cleaning or replacement of contacts, without disturbing the rest of the switch. Type C cabinets have been redesigned in order to allow for closer banking, and the handle closely hugs the side of the box in order to save installation space. The cover is now hinged on the front instead of the side.

THE ROUND TABLE

Fine Feathers

"Gosh, Al, that pump out on the floor looks like a million dollars. Must be going to pump scented bath water for a movie queen. Or is it by any chance going to Roumania?"

"It does look fine, Ed, I'll agree. But it has no unusual service to do. It's just a regular order."

"Then why all the dolling up, Al? Must cost a lot more to fix pumps up that way."

"It costs about ten dollars more, Ed. And I'm wondering whether it's good business or just a waste of money. What do you think?"

"It isn't worth ten dollars by a long ways, Al. Of course, it looks nice but if I were the customer I'd rather have the ten. It won't pump any more water just because it's bright and shiny."

"Not a drop, Ed. Yet it may be worth it to us, even if we charge the same."

"If you mean that it will help sell pumps, I don't believe it."

"But even you exclaimed about it when you came in the shop. If you'd been in the market for pumps, you'd have fallen for the glossy paint."

"Don't fool yourself, Al. When I buy a pump it's to deliver water. I just as soon have it without any paint at all."

"Now you're kidding yourself, Ed. Nice paint doesn't make a car any better so far as transportation goes, but you'd pick the shiny one over one with a dull or banged-up finish. You told me yourself that was one reason you wouldn't buy a used car."

"That's different, Al. Family pride and all that stuff."

"That's only part of it, Ed. Whether we know it or not, a fine appearing tool sells better than one that is rough on the outside. I'm going to try this new finish awhile and see what happens."

Is Al right about good finish helping to sell machines? Or will the practical man buy them on performance anyway?

Discussion

Who Buys the Micrometers?

There is no distinct advantage in having either the firm or the men owning the micrometers, apart from the matter of bearing the cost. If the men own their micrometers they should be checked periodically. The man who takes pride in his tools will usually be glad to have his micrometer checked. If he should refuse, he should be held responsible for any of his work that does not conform to the firm's standard gages.

Checking and adjusting micrometers that are in constant use calls for more than merely checking them with standard gages. Some men prefer to have the nuts tighter than do others, so that the screws do not work as freely. The tightness with which the micrometer grips the work between measuring surfaces varies with different men if the micrometers they are using are not equipped with ratchet stops.

Where the micrometers are owned by the men, each one should be adjusted to suit the owner's sense of feel. Where the micrometers are the property of the firm and are checked out to the men, each man should always be given the same micrometer, which he can adjust to suit himself. Permitting each man to check the micrometer he uses, whether it is owned by him or by the firm, insures that it is checked under working conditions.

—Robert Hutcheson,
Kenton, Middlesex, England.

When a man owns his own micrometer he is responsible for its accuracy. A skilled man who suspects the inaccuracy of his micrometer will test it by comparison with another micrometer or with a standard gage. Being his own property, he will take good care of it, which is the greatest guard against its developing inaccuracy. Inaccuracies, due to micrometers used by skilled men, are usually so small as to be negligible.

While I am in favor of skilled men owning and being responsible for their micrometers, I think that those used by apprentices and semi-skilled men, who have had but little experience in their use, should be furnished by the firm. In such cases it is advisable that the micrometers be issued on check and that they be returned to the toolroom at frequent intervals for testing.

The way in which semi-skilled men

handle micrometers should be watched, as defective work is often traceable to their improper handling. A good workman takes pride in his tools, and a good set of well-kept tools generally denotes that the owner is a good workman. A man who has no ambition to own a complete kit of good tools is usually an inefficient workman who cannot be trusted to do high-class work. —W. E. WARNER,
Bromley Common, Kent, England.

Al aptly states that there are mikes and mikes and although their readings may vary by only a thousandth, or even less, that variation is enough to militate against accurate work. And that is not the only evil. A man using his own mike, although it is possibly inaccurate, practically guarantees the accuracy of his work. Then, disputes will arise and it will not be until the workman's mike is proved wrong by test that the disputes will cease.

Many years ago, a company with which I am familiar took a firm stand against workmen using their own mikes. It eased the situation by purchasing the mikes owned by the men. These mikes were put in good condition and were issued by the toolroom, the hallmark of the toolroom being on every one. Production, as regards accuracy, went up by leaps and bounds, and disputes, of the kind referred to, ceased altogether. Were I in business for myself, I should purchase the mikes for my employees' use.
—J. E. TOWLSON,
London, England.

Change in Design

The builder should have a definite policy and should strictly adhere to it. If he adopts the plan of making designs to suit the customers, regardless of consequences, then designs should be changed when customers desire it.

But if the builder adopts the plan of building according to the best and most efficient designs only, maintaining a reputation for always turning out the best, then he should not change designs to suit customers. Such a builder will get his share of the kind of jobs he desires and will not regret losing the other kind.

If customers understand just what the policy of the builder really is, and that he will strictly adhere to it, they would not seek to change it.
—W. E. BROKAW,
Executive Secretary,
The Equitist League.

Al would be making a mistake to build a compressor that will not give standard performance, even though the customer agreed to accept all responsibility for the change in design. Sooner or later the customer would discover his mistake and he would either try to prevail upon Al to take the machine back and give him an allowance on a new one, or he would keep a stiff upper lip and worry along with the machine as it is. If Al made the trade, both he and the customer would likely lose through the transaction. If he refused, he would have a dissatisfied customer.

If the customer decided to worry along with the machine and his business associates discovered its shortcomings, the chances are that he would never tell them that it was of his own design, but would let them think it was Al's design and allow Al's prestige to suffer through his own mistake. Human nature is like that. Better to lose one order now than a flock later.
—W. J. OWENS

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One-Man Shop

A man with limited authority may be held responsible for results, provided he is given proper support by his superior. In Al's case, it would seem advisable that he train his best man to be able to assume complete responsibility for the shop in Al's absence. During normal operation, this key man should be considered as a working leader and Al should not only keep him informed as to the everyday affairs of the business, but should also delegate a certain number of instructions through him to the men.

In this way, the key man will gradually acquire the confidence and respect of the men, so that he can take effective charge of the shop in Al's absence. A modest increase in pay, together with a direct appeal to the man's pride in the successful operation of the shop is in order and it will produce real dividends. In summing up the situation, it should be possible to develop a satisfactory assistant at a very minor increase in cost by explaining the authority vested in the working leader to the men and then giving this key man firm support.

—W. E. BENEDICT,
Plant Superintendent,
Sloane-Blabon Corporation.

I do not believe it is advisable to operate a manufacturing business on a one-man basis. I am sure it would prove beneficial, not only in emergencies but at all times, for the owner of a small plant to select one or two trusted and competent men to assist him. Through proper cooperation with them they would acquire the necessary knowledge to take charge of the shop whenever necessary. Most men want to have some form of responsibility or authority, and to ignore than instinct will soon break down all initiative.

It is a difficult matter to develop good teamwork in a shop, but once it is established the flow of better work and constructive ideas will be greater. More new ideas will come from the brains of 30 or 40 men than from one or two. What is true in sport should be true in the plant; the most capable man should be the captain.

I think that operating a small plant in the manner outlined will aid in building a bigger and a better shop and will make it easier for the man with limited authority to obtain the desired results.

—PETER L. BUDWITZ.

One-man control of any business is a mistake because sickness and accidents are no respecters of persons, so Al would do well to pick out two or three of his trustworthy old timers and make them key men, as Ed suggests.

There is no man who does not react to the suggestion that his services are appreciated and that his employer considers him worthy of trust. If, in addition to such a subtle compliment, there is added a slight increase in pay, the man so singled out is going to do his best to deserve it. He is going to keep a sharp eye on the new man in the shop and put him wise to the best method of doing his work. There are a hundred and one other ways in which such a man will help to carry the load that Al now carries.

It is practicable to give a key man limited advisory authority if you hold him responsible only for the results expected under the limits laid down, but whatever these limits are, make it known to his fellow workers that you are behind him.

—ROBERT S. ALEXANDER.

● *Above:* The Barnes drill, Oilgear Fluid Power Feed equipped, back of the door in the head.

DESIGNERS seeking vastly improved functioning—sales departments eager for winning features—users hunting speed and economy—will get the facts now on Oilgear's revolutionary Fluid Power Feeds.

At right, a new Oilgear Fluid Power Feed. Note: Flanged mounting, as integral machine part . . . Inside pump, eliminating hazard and bettering appearance . . . Self-contained; auxiliary valves, tubing are integral with pump. Many other exclusive features. The OILGEAR Company, 1309 W. Bruce St., Milwaukee, Wis.

OILGEAR FLUID POWER FEEDS

(B-1001)

SEEN AND HEARD

JOHN R. GODFREY

Stainless Iron and Steel

Some of us get confused about the difference between stainless iron and stainless steel. According to the Midvale Steel Company, stainless iron usually contains less than 0.12 per cent of carbon and over 11½ per cent of chromium. Stainless steel usually has 0.25 to 0.35 per cent of carbon and from 12 to 13½ of chromium.

Special uses of both metals call for different percentages, which sometimes vary widely from the figures given. When extreme resistance to rust is desired the chromium content may be increased to 20 per cent. Stainless steel largely resists rust in proportion to its hardness.

Both metals forge readily at a little below 2100 F. They should be cooled slowly after forging or else reheated to 1,375 F. after which they can be cooled quickly if desired. When dead soft they machine rather badly, but if drawn at about 1375 F. they take a good finish. Complete softening is secured by pack annealing from about 1600 F., which is above the critical temperature.

Too Many Flywheels

Simplification by the elimination of parts that differ but slightly from others, but that require special tooling and the carrying of a large amount of spare parts, still presents great opportunities for economies. One, not very large, internal combustion motor plant that builds for various markets, makes 350 different flywheels. The differences are so slight in some cases that it should not be difficult to use one flywheel for several of the motors that now have a special wheel. Designing, to enable parts to serve several purposes, will prevent needless complications in manufacture.

Replacing Chilled Iron

Chilled cast iron has played quite a part in the making of many machine parts such as pump plungers and liners, car wheels and others. The "chills" cost money and the percentage of poor castings is apt to be high; as high as 75 per cent in extreme cases. Some pump makers are now using a high nickel iron up to 4½ per cent, and with 1½ per cent chromium. This gives sand castings that run as high as 650 Brinnel. In some classes of work this method has advantages although chilled iron is likely to retain a place in some industries. At any rate, the designer should know of this new mixture—Ni-Hard.

Double Heat-Treating

Using copper plate to prevent hardening of certain parts has long been common practice. Using it to prevent parts already heat treated from becoming harder while cyaniding the bore is not so common. This is the practice on some sturdy differential pinions of a well known truck. After the whole gear is heat treated to the proper Brinell for toughness in the teeth, the pinion is copper plated all over except in the bore. Then, it is given a cyanide bath which puts a very hard wearing surface where the wear comes on the differential spider. There are probably other places where this same method may be helpful.

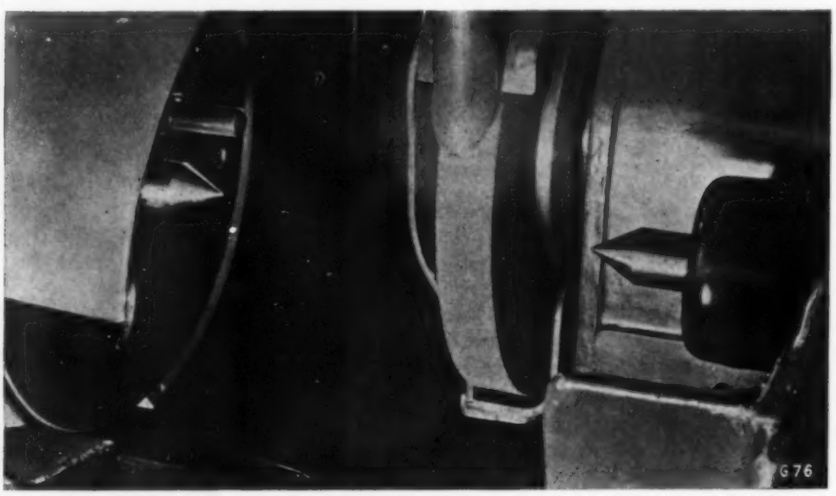
WITHOUT

Benefit of Special Equipment

● Special equipment is not necessarily required for economical high production grinding. In many instances standard plain or universal machines are found entirely adequate.

● The Landis Type C Plain Hydraulic Grinders, without benefit of special equipment of any kind, are being used for numerous high production jobs. Their flexibility plus the ease and quickness of change from one set-up to another make them suitable for a varied assortment of work. The Type C Hydraulic Universals, besides being universal in nature, are more productive than most machines of this type. Grinding departments are finding them quite desirable.

● Landis builds much special equipment but only when it can be economically justified. You may depend upon Landis engineers to recommend the less costly standard equipment when that is all that necessity demands. 188



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WAYNESBORO, PA.